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RESOLUTION of the Society for the Encouragement of Arts, Manufactures, and Commerce, June 17, 1767.

" *The Society for the Encouragement of Arts,*
" *Manufactures, and Commerce, will occa-*
" *ſionally publiſh in this Work, ſuch Pieces*
" *as they ſhall think proper to lay before the*
" *Public.*"

N. B. Thoſe Gentlemen, who are diſpoſed to favour the Editor with any communications, reſpecting improvements in Agriculture, or other uſeful matters, are requeſted to ſend them to Mr. NOURSE, Bookſeller to His MAJESTY, in order to their being inſerted in the THIRD VOLUME.

MEMOIRS

OF

AGRICULTURE,

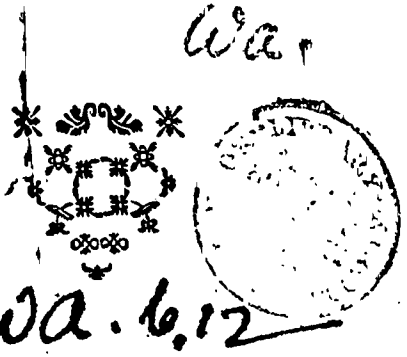
AND OTHER

OECONOMICAL ARTS.

BY

ROBERT DOSSIE, Esq.

VOLUME II.



LONDON,

Printed for J. NOURSE, Bookseller to His MAJESTY.

MDCCLXXI.

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TO

LORD ROMNEY.

MY LORD,

REASONS, too obvious for diſcuſſion, indicated the propriety of addreſſing to the King, the moſt eminent patron of uſeful as well as ornamental Arts, the Firſt Volume of this Work: a principal view of which is, the promulgation of improvements in thoſe Arts; and, particularly, of ſuch as

may be produced by the Society inſtituted, at London, for the encouragement of them. — Reaſons of a ſimilar nature point out the fitneſs of dedicating the Second Volume to Your Lordſhip, the President of that Society: to whom, moreover, it owes, in a great meaſure, its original eſtabliſhment, and the duration of its flouriſhing ſtate. — It would have been a faulty neglect, not to have embraced this opportunity of acknowledging the high obligation, which every member of the Britiſh community, as well as of that body, lies under to Your Lordship, for the very munificent offer of proviſional aſſiſtance, which yourſelf, and your noble relation, Lord Folkstone, the late Preſident, at your inſtance, made for the maintenance of its funds, at the firſt com-

commencement of the undertaking; and for your conſtant attendance, during ſo many years, whenever reſident here, on the chair: in which you have always exerciſed the moſt benign temper, unbiaſſed judgment, and patient attention.—This obligation of the Public to Your LORDSHIP is much inhanced, by the ſtriking example, you have ſet to others, poſſeſſed of great rank and fortune, of making thoſe advantages ſubſervient to the public welfare, at a period, when the diſſipation of pleaſures, and amuſements; or the ſole engagements of ſelf-intereſt, ambition, or party-ſpirit; have taken place of nearly all regard for more ſolid, liberal, or generous concerns.

The goodneſs of Your LORDSHIP's intention, in your endeavours to ſup-

port the Society, and promote its de-
ſigns, muſt of courſe be manifeſt to all
who are informed of theſe facts: tho'
the fruits of it, with reſpect to the
benefits, that have actually accrued
to the public, are adequately conceived
by very few; and greatly under-rated
by moſt. But whoever will take the
trouble, to examine the hiſtory of the
proceedings of the Society, inſerted in
the Firſt Volume of theſe Memoirs, will
be fully convinced, that the number,
and importance of the objects of per-
ſuit, as well as the ſucceſs in the attain-
ment of the ends, are greatly beyond
what could be imagined by thoſe,
who are unacquainted with the par-
ticulars.

As the ſpirit of this work is to emu-
late Your LORDSHIP'S conduct, and to
lend

lend an aid, that was much wanted, to theſe endeavours for the public ſervice, I hope for your approbation of the pains I have taken, in the faithful and correct publication of the papers, which the Society have done me the honour to intruſt to my care: -- in the explanations, and comments, I have annexed, to render thoſe papers more intelligible and uſeful: -- in the accounts, I have given, of ſome other momentous articles; of which, though communications relating to them had been made to the Society, there were no records, in a ſtate proper to be publiſhed; -- and in the original pieces, I have added conducively to the ſame purpoſes.—If I obtain that approbation, I ſhall eſteem it a reward for the performance of a taſk, attended with more difficulties, and embarraſſments,

barraſſments, than thoſe, who are unapprifed of the agitations of bodies compoſed of numbers of perſons of different humours, and notions, can well comprehend; and which none would ſubmit to encounter, who were not actuated with ſome degree of the ſame zeal for this meritorious cauſe, that ſo eminently inſpires, and diſtinguiſhes Your LORDSHIP.

I am, my LORD,

with the greateſt reſpect,

Your LORDSHIP's moſt obedient

humble ſervant,

ROBERT DOSSIE.

PREFACE.

AN earlier publication of this Second Volume of the MEMOIRS OF AGRICULTURE, &c. was announced at the time the Firſt was completed: but ſome unforeſeen accidents have rendered a delay of it unavoidable to the preſent. — The ſame circumſtances, which have cauſed this delay, have produced, alſo, ſome variation in the propoſed contents.—It was deſigned, according to a former declaration, to have continued the hiſtory of the proceedings of the *Society for the Encouragement of Arts, Manufactures, and Commerce*, with proper illuſtrative comments, in each ſucceeding volume: but after waiting, as long as expedience would admit, for the removal of ſome obſtacles, it was found impracticable with reſpect to the preſent.—An alteration, made, by the Society, in the mode of publiſhing the annual account of premiums and bounties, given by them, occaſioned an omiſſion of any ſuch account in their Premium-book of 1769: and the illneſs, and death of their

their ſecretary, in that year, prevented the reſpective liſt from being made out afterwards till late in the preſent year. This threw a temporary difficulty in the way of going on with that hiſtory then: for there would have been an impropriety, in not taking the ſame groundwork of authority for the principal matters, which had been before uſed in the other parts. In the mean time, the accumulation of papers, the Society had reſolved to communicate to the world, rendered it unfit to defer the publication of them any longer: and this volume was, therefore, formed without that intended part of its contents.

The continuation of the hiſtory of the Society from the year 1767, where it terminates in the Firſt Volume, to the end of the year 1770, with the explanations, and illuſtrations, as promiſed in the preface of the Firſt Volume, will be given in a Third: which will be publiſhed as ſoon as conveniently may be, after it is determined, what pieces the Society ſhall, during the next term of their meetings, think proper to impart to the public.

The contents of this volume are, nevertheleſs, of ſo various, and intereſting a nature, that it is hoped, they may well compenſate for the

the omiſſion of that part of what was originally deſigned to have had a place amongſt them: and ſome very important articles will be more ſeaſonably publiſhed than they would have been, had the delay, and vacancy for them, not happened from the above-mentioned incidents.

It may be right to take notice of a circumſtance, that might, perhaps, otherwiſe be thought to depreciate a part of what is here offered to the public, if it were left unaccounted for.—Some of the communications to the Society, which are inſerted in this volume, have before appeared in print, alone, or in ſome miſcellaneous compilements; and, conſequently, may be deemed by ſome leſs novel, and original than what is expected to be found here. But, excluſively of the account of rearing and fattening hogs, by Mr. YOUNG, who had the Society's permiſſion to publiſh it, the reſt of the pieces ſo publiſhed, except one, were ſurreptitiouſly obtained by the editors; and all of them printed, not only without permiſſion; but, for the moſt part, in ſuch a faulty, and incorrect manner, as renders them of little value to the public; and muſt diſparage ſo liberal a body as the Society, if they were ſuppoſed to have paſſed through their hands.—

Notwithſtanding, therefore, this ſeeming anticipation, I conſidered it, as neceſſary to the acquitting myſelf fully of my engagements to the Society, to inſert all they ſent to me: as their obvious intention, in the Reſolution "to publiſh in "this work, ſuch pieces, as they ſhall think pro-"per to lay before the public," was, to have the whole of the information, they ſhould deem it fit to impart, conveyed to the world in a faithful and authentic manner; and preſerved in ſome one known repoſitory, where it might always be found by thoſe, for whoſe uſe it was deſigned.—It may be proper to add, alſo, that the Society have never, as a body, given the leaſt ſanction to any other work of a ſimilar nature to this: notwithſtanding whatever may ſeem to have the appearance of it, in ſome late propoſals, and advertiſements for the publiſhing ſuch a work.

The importance of the ſubject of thoſe articles, compoſing this volume, which are not publiſhed as communications from the Society, is too apparent, to leave occaſion for any apology for them in that light; and they are ſtudiouſly treated with as much brevity and perſpicuity, as the nature of what conſtitutes them will, advantageouſly permit.

There is one, however, which takes up a conſiderable ſhare of room, that may require ſome notice, to ſhew, that it is not an exception to this pretenſion: I mean the Diſſertation on the Murrain of Cattle.—No-body will, I preſume, deny the very momentous relation, which a general knowledge of that diſeaſe, and the means of the prevention, or cure of it, have to the intereſt of agriculture in particular, as well as to that of the public in a more extenſive view: but it may poſſibly be objected, that I have treated of it, as to ſome points, in too abſtracted and learned a manner for common readers of works of this kind —To ſuch a charge, I plead thus in excuſe:—There are ſeveral doctrines advanced in that Diſſertation, both with reſpect to the nature and treatment of the diſeaſe, which being not only new, but contrary to received opinions, require ſome demonſtration.—Though I might, indeed, have delivered them, without any phyſiological or medicinal diſcuſſion of their proof, as ſimple propoſitions; yet they would then have had no ſupport, but a mere ſingle *ipſe dixit*, againſt the authority of a number of other writers. To give them due weight, it was neceſſary to prove them by arguments: and thoſe arguments could be founded only on ſcientific reaſonings, and principles.

ples. — The readers, who are leſs judges of this demonſtrative part, may, nevertheleſs, yet comprehend well the matters proved: and they ſhould conſider the means of proof, as an appeal to others verſed in the relative ſciences, which eſtabliſh a juſt ground for their own confidence, or aſſent. — To offer new opinions, in matters of great conſequence, againſt confirmed notions, without aſſigning any reaſons for them, would be as unſucceſsful in the effect, as arrogant in the appearance.—The manner, in which I have treated the ſubject, being, therefore, neceſſary on this ſcore, I hope the abſtruſity, and prolixity, which to ſome, may ſeem to ariſe from it, will be candidly diſpenſed with: ſince nothing, ſhould be omitted on ſuch an occaſion, that tends to promote a matter of ſo great concern to the national welfare, as the endeavouring to avert, or, if it ſhould come on, alleviate one of the greateſt calamities, that can poſſibly befal any country: the danger of which is at this time moſt evidently impending over us.

CON-

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MEMOIRS

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ARTICLE I.

Account of an improved Method of cultivating Lucern, communicated by CHRISTOPHER BALDWIN, *Esq. to the* Society for the Encouragement of Arts, Manufactures, and Commerce; *and inserted here at their Request.*

To *Robert Dossie*, Esq.

SIR,

THE Society for the Encouragement of Arts, Manufactures, and Commerce, have directed me to deliver to you Mr. Baldwin's letter, in order to it's being published in the Memoirs of Agriculture, if you think proper.

By Order,

PETER TEMPLEMAN.

SIR,

AS I am always desirous of employing my leisure hours to some valuable purpose, so I am tempted to lay before you an account of my experiments and observations in the culture of lucern, that you may judge, if my time is spent with any advantage to my country, as I anxiously wish it may, and with a view to promote the great end of your most useful Society.

The excellence of lucern as a food for cattle of every kind, either in its succulent state, or as hay, is so well known, that I shall say nothing as to its merit in those respects, but take it for granted it is generally allowed by every gentleman and farmer, who is acquainted with it: the great object I have in view, is to point out the method of cultivating it at the least expence, and to shew the public its advantages over every other grass; and that upon lands which cannot be made to carry grass with advantage, for any number of years, but must be kept in tillage, and only come into grass in rotation with other crops.

The present known methods of cultivating this grass, are by drilling the seed, or transplanting at certain distances, and by broad cast, some recommend one method, some another, each with a preference to their favourite scheme; however, it is certain that lucern may be cultivated with great advantage in either method: when it is cultivated

by drilling or tranſplanting, it becomes a matter of great importance to know what are the proper diſtances from row to row, and what inſtruments are beſt adapted to keep the intermediate ſpaces free from weeds. Upon both theſe important points, I hope what I ſhall now lay before you will prove ſatisfactory;—or that ſome gentlemen will be found, who, as real friends to their country, will purſue theſe experiments, and then a few years will put the matter out of doubt.

In regard to the diſtance of the rows, Mr. Tull, Monſ. Lullin, Duhamell, all the French and many Engliſh writers, lay it down as a determined point, that lucern ſhould be cultivated at three feet four inches diſtant from row to row; but for my part, I muſt beg leave to differ in opinion with theſe gentlemen; and as I ſpeak from experience, as you will ſee by the following experiments, I hope it will not be thought preſumption: for though I am far from pronouncing poſitively, yet I am a little inclined to think theſe gentlemen ſay, the intermediate ſpace *muſt* be three feet four inches, becauſe they were at a loſs for inſtruments that would effectually clean it, if the ſpace was leſs.

I confeſs myſelf much obliged to the very ingenious Mr. Baker of Ireland, for putting me on the method of determining the produce of lucern by the ſquare rod. I firſt cut a rod in Auguſt, 1766, and was really ſur-

priſed to find it weigh ſeventy-two pounds. I own I had no idea of its yielding any thing like this; nor did I think of trying, till one day recollecting the Iriſh rod was twenty-one feet ſquare, I reduced Mr. Baker's produce to our meaſure of ſixteen feet and half, and found it to be, as before-mentioned, ſeventy-two pounds.

Mr. Baker has laid before the Dublin Society an excellent ſeries of experiments, tending to point out the moſt advantageous method of cultivating this valuable graſs. He ſays, that from a rod of lucern

	lb.
In 3 feet drills, he mowed green	20
2 feet — — —	27
1 foot — — —	26
broad caſt	37

It is proper to obſerve here, that this is according to Engliſh meaſure, and that it was from his firſt year's growth. In this gentleman's laſt year's account of the next crop, he ſays he cut on

	In 3 feet drills.	2 feet drills.	1 foot drills.	broad caſt.	tranſplanted.
	h. q. lb.	h. q. lb.	l. q. lb.	l. q. lb.	l. q. lb.
4th June	0 1 20	0 1 23	0 2 12	0 3 14	0 2 13
27th Aug.	0 1 3	0 1 7	0 0 24	0 0 18	0 1 15
10th Oct.	0 1 17	0 1 19	0 1 4	0 0 0	0 1 19
	1 0 12	1 0 21	1 0 12	1 0 4	1 1 9

I have laid before you theſe very accurate experiments, that you may be able to judge with the greater preciſion of the merit of the method I have purſued; and from the ſucceſs which

which has attended it, I beg leave to recommend to others, not doubting but they will be pleaſed with their ſucceſs.

The field of lucern, in which I made my experiments, contains about four acres. In September, 1764, I tranſplanted two acres, and in May, 1765, I drilled another acre; both are at twenty inches apart in the rows: this is juſt half the ſo much recommended diſtance, viz. three feet four inches. As I could not conceive that a tap-rooted plant, like lucern, could require ſuch a ſpace of ſurface, I determined upon taking only half the quantity; fully convinced, that if I found the plant required more room, I could then take up every other row, and leave the remainder at three feet four inches; but my ſucceſs has been ſuch that I have no longer any thoughts of altering my plan; on the contrary, I have brought the remaining acre into drilled lucern, as it lay parallel to the other drilled acre. This was done laſt ſpring, after it had been well ploughed, by ſowing firſt in broadcaſt, two buſhels of barley on the 30th of March, and from the 8th to the 11th of April it was drilled by hand with lucern, in rows parallel to the others; and the expence I found to be about ten ſhillings per acre.

I ſhall now lay before you an account of my crops for laſt year, being the third year of its growth. I began cutting on the 11th of May; and on the 30th of that month I cut a rod

ſquare of drilled, and found the weight three quarters eleven pounds, i. e. ninety-five pounds. On the 19th of June a rod of tranſplanted, then in full-bloom, weighed one hundred weight and eight pounds, i. e. one hundred and twenty pounds. On the 16th of July, I found the ſecond crop weighed on an average two quarters of a hundred ſix pounds, i. e. ſixty-two pounds. On the 27th of Auguſt, I found the average-weight of the third crop to be one quarter twelve pounds, i. e. forty pounds; and about one half the field was cut the latter end of September the fourth time, when a rod weighed one quarter two pounds, i. e. thirty pounds. Now if you take the medium weight of

	h.	q.	lb.
the firſt crop, which is	0	3	24
the ſecond ditto,	0	2	6
the third ditto,	0	1	12
only half the fourth,	0	0	15
	2	0	1

you will find that a rod ſquare yielded me two hundred and one pound; and I think will convince you, that my method is ſuperior to the other: indeed, as I have before hinted, it is difficult to conceive of what advantage three feet four inches of the ſurface can be to a tap-rooted plant. If the advocates for a larger ſpace, ſay it is abſolutely neceſſary to deſtroy the weeds and keep the ſurface looſe, this I can do with my inſtruments, as effectually as they can; but ſtill the quantity produced,

produced, muſt determine the merit as to the mode of culture: and I have no doubt, but it will determine it in the breaſt of every impartial huſbandman; though I mean only to make you acquainted with the advantages ariſing from my method of cultivating this graſs; anxiouſly hoping, that a better method may yet be diſcovered by others.

I muſt not omit telling you, that on the 16th of July laſt, I cut from a broad-caſt field of lucern, in full bloom, a rod ſquare, and found the weight to be one hundred and twenty-ſix pounds, that is, one hundred and thirty-eight pounds. I am ſorry to ſay, I neglected weighing any more in this field; but can with great pleaſure inform you, that it was cut three times, and that the three ſtacks are computed to contain eighteen loads. The field is four acres and a half, and the lucern ſeven years old; nor is this an uncommon produce from broad-caſt lucern: a very valuable member of your ſociety made forty-eight loads of hay from about eleven acres in the pariſh of Mitcham, two years ago; but the land, though very fine, yet being wet, it went off, and ever will do ſo upon wet land. I have ſeen prodigious crops on ſuch lands for two or three years, but it always goes off about that age: dry light land, in tolerable condition, with a deep ſtaple, appears to be the beſt adapted to the culture of lucern: mine is light, but very ſtony for about eight

or ten inches; under that, a rock of gravel: and ſurely it muſt be deemed a great happineſs to this country, that at a time when we ſo much abound in horſes, a graſs is found to thrive beſt upon lands but indifferently adapted to the growth of natural graſs.

I had an opportunity laſt ſummer of making ſome obſervations, which I think worthy of being laid before you: With part of the firſt crop I fed my own horſes and cows, the remainder I made into hay; and it is hardly neceſſary to ſay, no hay is ſuperior; indeed I believe none equal to it for ſweetneſs and nutritive quality. The ſecond crop I ſold in my neighbourhood, to ſoil horſes, when I had the pleaſure to find every one much pleaſed with its excellence as a green food; and as it was all weighed out to each perſon, I had an opportunity of diſcovering that a coach-horſe would eat in the twenty-four hours ninety pounds. Mr. Baker has calculated upon forty-nine pounds; but I have no doubt but a gentleman of his great accuracy has ſince diſcovered, that a large-ſized horſe will actually eat full ninety pounds in twenty-four hours. I was alſo from hence led to obſerve, that an acre would feed at this rate five horſes for twenty-one days. Obſervations of this ſort have their advantage, as by this means gentlemen and farmers are enabled to determine what quantity of ground it is neceſſary for them to lay down for their reſpective number of horſes:

horſes; though prudence will dictate to them to allow rather too much than too little.

In the courſe of my experiments I have obſerved that lucern is not only excellent as a food for horſes, but alſo as a phyſic: its effects are not only like thoſe of green tares or clover, for it does not make horſes foggy in their work as they do, neither does it operate much as a purgative, but ſurpriſingly as a diuretic, inſomuch that if care is not taken, in a ſtable with five or ſix horſes, it will be in a manner flooded; and though I have attended to it very carefully, I have not been able to diſcover any great advantage from giving them corn when they are fed upon green lucern; however one quartern is fully ſufficient for a ſaddle or coach-horſe; and I have ſeen among the horſes I ſoiled this ſummer, ſome which were in the loweſt ſtate as to fleſh, ſupriſingly recovered in the courſe of a month; and one in particular, reduced very low by a violent purging of long ſtanding, to which the greateſt aſtringents could give no relief, was in three days time perfectly reſtored to proper habit of body in that reſpect: it acted as an alterative, bringing on a great diſcharge of urine, and in five weeks time the horſe was again in full fleſh. Laſt year, and this, I fatted ſmall Welch wethers on lucern, and they all yielded from eleven and half to twelve and half pounds of fat: and though I had great difficulty in keeping them at firſt in my

other

other fields, yet I never found that they attempted to go out of the lucern, though there are ſeveral gaps in that field.

It remains now that I inform you of the inſtruments which I have invented for clearing lucern in rows, either drilled or tranſplanted; not that the uſe of theſe inſtruments, one of which is a horſe-hoe, the other a hoe-plough, are by any means confined to the culture of lucern only; on the contrary, they may likewiſe be very advantageouſly uſed in the cultivation of any other plant in equi-diſtant rows.

The foreign horſe-hoes, and alſo thoſe which I have ſeen in the Society's poſſeſſion, which in general are conſtructed upon the principle of one broad ſhare, or hoe, I venture to pronounce inadequate to, and improper for the purpoſe; for if the land is ſtony, the ſhare is thrown out of its bias, and the plants are cut up, ſometimes on one ſide, ſometimes on the other; nor can the ſkill of the moſt able ploughman prevent it: of this kind is the famous Monſ. Lullin de Chateauvieux's Single Cultivator, one of which I had made from a drawing in Mr. Mills's excellent Syſtem of Huſbandry. I was pleaſed with its appearance in the plate; but from experience, I found the bad conſequence before-mentioned attending it, and was therefore forced to give up the uſe of it.

Clearing lucern in rows by over-hand or

Dutch

Dutch hoes, I found ſo very expenſive, that no farmer can ſupport it, and I pay little regard to what may be done by the mere dint of money; it is the ballance of the account, in a national light alone, that can engage my attention.

In the autumn 1766, finding my drilled and tranſplanted lucern was got very foul again, and knowing the expence of hand-hoeing was very great, I knew not well what ſteps to take; however, I got a worthy member of your Society to ſhew me the inſtruments which had been laid before them, for clearing lucern in rows: theſe I found as before-mentioned, all go on the principle of one broad ſhare, which I knew from experience would not anſwer in *ſtony ground*.

Neceſſity is truly ſaid to be the mother of invention; for, in my diſtreſs, I was drove to try my own little mechanical abilities; and having ſeen the errors of others, I endeavoured to avoid them: therefore, inſtead of one broad ſhare, I have ſeveral harrow-tines and ſmall hoes, ſo diſpoſed, that though ſome may ſtrike againſt a ſtone, yet from the ſmallneſs of the ſize, the ſhock is leſſened; they are leſs liable to be interrupted, and the others ſerve to give ſteadineſs, by which means this horſe-hoe is always kept properly at work; and many gentlemen who have ſeen it work, have all declared themſelves perfectly well ſatisfied with its performance.

As

As my field was over-run with graſs, and full of weeds, when I firſt made uſe of my horſe-hoe, ſo it brought up ſuch quantities, that I carted off ſix loads from three acres: but notwithſtanding the great advantage of this inſtrument in cleaning lucern from weeds, yet it operates only on the ſurface like other hoes, that is, about an inch deep; however, graſs and weeds will return; and I was well convinced, that if an inſtrument could be contrived, that would give a deep ploughing between the rows which were only twenty inches apart, it would contribute yet more to deſtroy the weeds, and be of great ſervice to the plants themſelves. Upon this I tried a ſmall plough which I commonly uſe; but I ſoon found it would not anſwer, as it threw up ſo large a quantity of mould, that the plants were quite buried: this difficulty, after conſidering ſome time on the ſort of inſtrument neceſſary for obtaining the end I propoſed, led me to invent my *hoe-plough*, which did its buſineſs in the completeſt manner I could wiſh. It was worked up and down each row, and brought up great quantities of couch and tap-rooted weeds, which the horſe-hoe could not reach. After the field was hoe-ploughed in this manner, which was in November 1766, it was laid ſmooth again with a pair of common harrows worked acroſs the rows, and near two loads more of weeds and trumpery carted off.

Both

Both theſe inſtruments are eaſily worked with one horſe; and I flatter myſelf, they will be found to have the principal requiſites in inſtruments of this kind, that is ſtrength, and ſimplicity of conſtruction. Complicated implements of huſbandry, frighten the farmer and his ploughman; theſe, the moſt ignorant may uſe with facility: indeed, if I may be allowed to ſay it, they of themſelves plainly point out the uſes to which they are adapted and intended. I will only add one more advantage that attends them, which is cheapneſs, viz. about thirty ſhillings each; and I ſhould be glad to recommend to the Society, the perſon who makes them, (under my direction) as a perſon worthy of notice on many accounts. His direction is, "K. Edwards, wheel-wright, near the Plough, "Clapham."

Since my firſt inventing theſe inſtruments, I have never uſed any hand-hoeing; my method is to paſs the horſe-hoe through the rows after each mowing. In the winter, I give the field a good ploughing with the hoe-plough; and in the ſpring lay it ſmooth with the horſe-hoe: two acres may be done in a day; ſo that the expence of cleaning lucern, is by theſe inſtruments reduced to a mere trifle.

When a field of lucern in rows, is ſo extremely foul, that it is thought hardly poſſible to recover it, I would have the hoes under the handles

handles taken out, and the three large tines put in their place; then paſs it once over, lifting it up behind every now and then as it goes on, to drop the great quantity of weeds which it collects; after which, cart off theſe weeds, then replace the hoes, and go over the field again, when I have no doubt but every gentleman will be ſurpriſed at its effect.

I hope I may now flatter myſelf with having pointed out a method of cultivating this valuable graſs, at the leaſt expence, and ſhown its advantage over every other graſs, by ſhowing a mode of culture ſuperior to that which has been ſo much recommended; I ſhall therefore cloſe the ſubject, by pointing out the proper times for cleaning broad-caſt lucern by harrows, which, from experience, I ſee anſwer the purpoſe perfectly well; therefore let the firſt crop, when intended for hay, be carted as it is cut, to another field, and the harrow ſet to work immediately; for at this time, the ground is in a looſe ſtate, the weeds weak, and many of them very ſhallow rooted; ſo that one tine is of more ſervice than three, when the ground is become ſettled and hard. — Another critical ſeaſon for harrowing lucern, is, in the winter upon the breaking up of a froſt, when the ground is in a looſe perforated condition; owing to the fermentation occaſioned by the nitrous ſalts then ſoaking into the earth, ſo that the graſs and weeds are in a manner lifted up and expoſed

to

to the tines of the harrows; whereas the lucern, from its deep tap-root, is kept firm, and out of reach from the harrows.

I ſhall now beg leave to conclude this long account, which, I hope, will prove fully ſatisfactory to the Society, with juſt adding, that if any gentleman who has purchaſed theſe inſtruments, find the leaſt difficulty in working them, I ſhall have great pleaſure in removing thoſe difficulties, if they will do me the honour to call at my houſe.

I am Sir,

Your moſt obedient ſervant,

Clapham-Common,
Novemb. 1767.

CHRISTOPHER BALDWIN.

ARTICLE

ARTICLE II.

Directions for making a cheap, ſtrong, durable, and handſome Coping for Walls, communicated by the late PETER WYCH, *Eſq. to the* Society for the Encouragement of Arts, Manufactures, and Commerce, *and inſerted here at their Requeſt.*

To *Robert Doſſie*, Eſq.

SIR,

THE Society for the Encouragement of Arts, Manufactures, and Commerce, have directed me to deliver to you Mr. WYCH's letter on Coping, in order to it's being publiſhed in the Memoirs of Agriculture, if you think proper.

By Order,

PETER TEMPLEMAN.

TO make a coping of plaſter for all exterior walls, ſuch as garden-walls, pond-heads, park-walls, &c. take a quantity of ſuch plaſter * as is commonly uſed for floors,

* Any tarras, plaſter, or calcined gypſum, may be applied to this purpoſe as well as that here mentioned to be obtained in Nottinghamſhire. The freſh, which has been only once calcined, will be the beſt. For though Mr. Wych below mentions ſuch as has been before employed and ſeveral times burnt, yet it is well known, that plaſter loſes much of its binding or coheſive quality every time it is calcined after the firſt.

in

in and about the county of Nottingham, burnt in the manner there practiſed. Then beat it, and ſift it, till it be rendered quite a fine powder. This done, to every eight buſhels of the powder, add one buſhel of well-calcined aſhes of Nottingham-coal, that are perfectly clear of ſand or kitchen-duſt: the beſt aſhes for this purpoſe are thoſe of brew-houſes, or glaſs-houſes, if they can be conveniently procured. When this mixture is made, put it into a trough; and pour water thereon till you make a paſte of it, like good mortar. Then caſt it in frames on your wall to the thickneſs of two inches on at each ſide; and to riſe to three inches in the center: after which trowel it. The four ſides of the frames are to be made of wood, twelve feet in length, two inches high, and the breadth the thickneſs of the wall.—When you remove your frame in order to lay another length of coping, you are to leave an interval of two inches between the laſt and next ſucceeding length: becauſe plaſter has the property of extending itſelf; and that always in a ſtraight line. Therefore, in a few years, thoſe intervals will be filled up. If you find that the intervals fill up too ſoon, you are then to ſaw off a part of it, to give it room to extend: otherwiſe, it will riſe in the middle; and a hollow will be left between the wall and coping. The appearance of this coping at firſt is in colour like lead, beautiful to look at: and the coping itſelf

is as durable as free-ſtone. In Nottingham-ſhire, free-ſtone work, thus laid, is computed at two ſhillings the ſquare-foot: whereas this plaſter-coping will not ſtand you in more than three-halfpence; and anſwer all the purpoſes as well. At Godeby, in the county of Leiceſter, Mr. Wyche has uſed this kind of coping prepared exactly as above-mentioned: and the work has ſtood perfectly ſound for upwards of twenty years: and now gathers moſs, which is a ſure ſign of durability.—The utility of this coping is much to be eſteemed: as, in a little time, a great quantity of work may be done. For what in ſtone-coping will take up ſix months, with the like number of hands, will be performed in plaſter-coping in one month.

N. B. In the above account, it muſt be obſerved, that the proportion of eight buſhels of plaſter-powder, to one buſhel of calcined aſhes, is proper, when you uſe old plaſter, that has ſerved for ſeveral uſes before, and has been often burnt. — But if you uſe new plaſter dug out of the pit for the purpoſe of coping, you are then, to every four or five buſhels of powder, to add one buſhel of aſhes.

P. S. When you build your walls for this kind of coping, remember to lay your laſt courſe of bricks, ſo as to project one inch from

from the wall. This done, take care to level the top of the wall, with a thin coat of mortar, that the ſurface of the wall may be perfectly ſmooth, from one end to the other. When the mortar is quite dry, lay your coping on it, that by having a level foundation, it may extend itſelf freely. But, if by any hole's being left in the work, the extenſion be retarded, its force will greatly damage the wall.

December 22d, 1760.

After ſome years, when the work appears rough, you may ſpread over it a thin coat of plaiſter, mixed as above directed; and the whole will appear as new-laid, juſt as a cieling appears freſh after white-waſhing.

ARTICLE III.

Account of a Method of making Mortar, which will be impenetrable to Moiſture, acquire great Hardneſs, and be exceedingly durable, preſumed to be that uſed by the Antients.

THE following method of preparing mortar was communicated, by me, to the Society for the Encouragement of Arts, Manufactures, and Commerce, in the year 1760. The advantages of this method were diſcovered, after trial of many others, by a gentleman, at Neufchatel, in conſequence of the following circumſtances. He had a houſe, the back-part of which being cut out of a rocky hill, the ſprings of water forced their way through the walls, wainſcot, plaſter, or whatever he uſed as a facing to the rock; and rendered the rooms very detrimentally wet. He was neceſſarily led to endeavour, by the uſe of all the common compoſitions, to exclude the moiſture: but every thing failed to effect this purpoſe, till he tried the mortar below deſcribed. This he found perfectly anſwered his end of preventing any tranſudation of the water: and it grew ſo tenacious and firm, by time, that he was induced to believe the method of compoſition was the ſame with that purſued by the antients

in preparing their mortar. In this light, as a diſcovery of the mortar of the antients, he communicated it to Lord M——l, at that time reſiding at Neufchatel, to whom he ſhewed the rooms he had rendered dry by means of of it; and which had then been plaſtered with it about eleven years. The plaſter appeared as white as marble; and nearly as hard: nor was there the leaſt ſign of any moiſture's pervading it in the places where, before it was applied, the water from the rock had continually forced its way, in ſpite of the various other means that had been employed to exclude it. Lord M——l believing this diſcovery to be a matter of utility, gave the recipe, and the particulars of the account, to me, as he had them in writing from this gentleman; in order that I might impart them to the public, in what manner I ſhould think proper, if there were any proſpect of their being of advantage. I accordingly delivered a memoir, containing a tranſlation of them, with ſome additional remarks, to the Society for the Encouragement of Arts, &c. with the view of having them inſerted in the Hiſtorical Regiſter, which was then propoſed to be publiſhed annually by them. But the deſign of publiſhing ſuch a Regiſter not taking place, and the memoir having been loſt out of the Society's Gard-book, I thought it expedient to make a freſh communication of it in this place: as it may very properly fol-

low the foregoing valuable article of a method for making coping for walls. — The manner of preparing this mortar is as follows:

"Take of unſlacked lime, and of fine "ſand, in the proportion of one part of the "lime to three parts of the ſand, as much as "a labourer can well manage at once: and "then, adding water gradually, mix the "whole well together by means of a trowel, "till it be reduced to the conſiſtence of mor-"tar. Apply it immediately, while it is "yet hot, to the purpoſe, either of mortar, "as a cement to brick or ſtone; or of plaſ-"ter for the ſurface of any building. It "will then ferment for ſome days, in dry "places; and afterwards gradually concrete "or ſet; and become hard. But in a moiſt "place it will continue ſoft for three weeks "or more; though it will, at length, attain a "firm conſiſtence, even if water have ſuch ac-"ceſs to it ſo as to keep the ſurface wet the "whole time. After this, it will acquire a "ſtone-like hardneſs; and reſiſt all moiſture.

"The perfection of this mortar depends "on the ingredients being thoroughly blended "together; and the mixture's being applied "immediately after to the place where it is "wanted. In order to this, about five la-"bourers ſhould be employed for mixing the "mortar, to attend one perſon, who applies "it."

Chalk-

Chalk-lime, which is the kind moſt commonly uſed in London, is not fit for this purpoſe, on account of its containing flints; which makes it require to be ſkreened before it can be tempered with the water and ſand. This ſkreening renders the ſlacking the lime previouſly neceſſary: and the ſlacking it before it be mixt with the ſand prevents its acting on the ſand, ſo as to produce their incorporation; which power it loſes, in a great degree, after its combination with the quantity of water that ſaturates it. Lime made of lime-ſtone, ſhells, or marble, muſt be therefore had for this purpoſe: and the ſtronger it is, the better the mortar will be. If ſuch lime be wanted for this end in London, though it is not commonly uſed there, it may be obtained at ſome of the wharfs; or at a work, carrying on for making ſtone-lime, on the banks of the river Thames, above Vaux-hall.

Beſides this regard to the kind of the lime deſigned to be employed in making the above-mentioned mortar, that which is intended for it ſhould be be carefully kept from the acceſs of air or any wet: otherwiſe it will attract moiſture; and loſe proportionably that power of acting on the ſand, by which their incorporation is produced. It is proper, alſo, to exclude the ſun and wind from the mortar itſelf for ſome days after it is applied: that the drying too faſt may not prevent the due

continuance of the fermentation, which is neceſſary for the action of the lime on the ſand.

Over and above the value of a very hard and durable mortar, for general purpoſes, the property which this kind has in reſiſting and excluding all moiſture, gives it very peculiar advantages in particular caſes. For, as it may be uſed, and will grow perfectly hard, even though moiſture have acceſs to it when laid on, and while it is fermenting and ſetting, it is of very high utility for preventing the ouſing of water through the floors or ſides of many edifices; as well vaults as others, where mortar prepared in the comon method would fail of that effect; and continue wet for any length of time. It is, likewiſe, of great conſequence in the erecting bridges, or in making the foundations, or other parts of buildings raiſed in water, or ſituated in very damp places; or for pointing, or plaſtering conduits, or reſervoirs of water: for which laſt purpoſe, it appears to anſwer the end of tarras, or the gypſeous plaſter; and may ſave the expence of thoſe materials; which are generally much dearer than lime. The ſuperiority of this to the common mortar is owing to the intimate commixture of the lime with the ſand, at the ſame time it is combined with the water, before its attractive power be diminiſhed by its combination with water: and this ſhews the defect in the common method of making mortar: where the lime is ſlacked before it is

commixed with the ſand; and where, in part, old mortar, common earth, or other ſubſtances, with which lime has no peculiar ſpecific attraction, are generally added, or uſed wholly in the place of ſand. Such mortar is frequently found, inſtead of growing harder with time, to appear, as it were, calcined in ſome years; and to moulder into duſt: eſpecially where the air has acceſs. The ſlacking the lime before its mixture with the ſand is, in a great meaſure, unavoidable in the caſe of ſuch as is made of chalk, for the reaſon above aſſigned: and other lime bears a higher price in London. The expence of labour, alſo, in mixing the lime and ſand with a trowel, as directed in the recipe, inſtead of beating them together in the common way, is, perhaps, too great every-where for preparing mortar for general purpoſes. But in the extraordinary caſes, above enumerated, it will be found to anſwer: and in all caſes it is proper to have regard to the principles, on which the goodneſs of mortar ſo prepared depends; and to come as near this method as circumſtances will admit.

When a very great hardneſs and firmneſs are required in this mortar, as in ſeveral caſes where ſtrong cement is wanted for ſtones; or for projecting parts of buildings, or other purpoſes; the uſing of ſkimmed milk inſtead of water, either wholly or in part, will produce the deſired effect; and render the mortar extremely tenacious and durable. It

It is confirmed, by the accounts, we have in Pliny, Vitruvius, &c. of the Roman mortar, that the gentleman, who concluded, from his obſervations of the ſimilarity of the conſiſtence of the mortar he thus prepared, with what is found in the antient buildings, the manner of preparing them was the ſame, was not miſtaken in his conjecture. For it appears, the ſame method of preparation was followed then in the mortar made in great quantities for common purpoſes: only there is reaſon to believe, that milk, alſo, was uſed in ſome particular caſes, either wholly or in part, inſtead of water. The appearance of perpetual durability, and the exceeding great hardneſs of the mortar now found in the remains of the antient buildings, are proofs of the excellence of this method; and ſhew that it ought to be attended to in all inſtances, where long duration is of moment. The total deviation from it in the preparation of the mortar for many of our buildings, particularly in London, is the occaſion of the quick decay of them; or frequently of the immediate fall of houſes or parts of houſes, even before they are finiſhed; and the means alſo, of great fraud on the purchaſing proprietors of ſuch houſes; as well as danger to the tenants, and even paſſengers. Whence, it calls loudly for the controul of the legiſlature, to puniſh ſuch as do not uſe fit materials in the compoſition of mortar.

ROBERT DOSSIE.

ARTICLE IV.

Obſervations on the comparative Utility of the Drill and Broad-caſt Methods of Huſbandry; and on the Turnep-cabbage; communicated in a Letter from the Rev. Mr. EDWARD HOWMAN, *of* Giſſing, *in* Norfolk.

To *Robert Doſſie*, Eſq.

SIR,

I Have juſt had the pleaſure of peruſing the firſt volume of the Memoirs of Agriculture, &c. a work which I eſteem a very valuable acquiſition to the public.

As a lover of huſbandry, I was particularly pleaſed with Sir Digby Legard's courſe of experiments, relative to the comparative profits of the old and new huſbandry: which I look upon to be the beſt conducted, in order to ſhew the reſpective merits of the two modes, in a comparative point of view, of any in our own country, that have come to my knowledge.

Theſe experiments have cauſed ſome reflections to occur to me relative to the abſolute merits of the old and new huſbandry, with reſpect to the public; which I ſhall take the liberty of communicating to you. I ought, perhaps, to apologize for ſo doing: as I have at preſent very little experimental matter to communicate; (nothing, indeed, relating to the new huſbandry).

But

But I cannot help thinking, that reaſoning upon the experiments of others, may ſometimes be as profitable, as the making experiments one's ſelf. Whether what I have to offer be of this ſort, I will not pretend to determine. You are at liberty to make what uſe of it you judge proper: either to inſert it in the Memoirs; or to deſtroy it. It is a particular ſatisfaction to me, that, in the Memoirs, no one will be in danger of being treated in that illiberal manner, for a difference of opinion, which many were in the Muſeum, Ruſticum; much to the diſcredit, if not the entire deſtruction * of that otherwiſe valuable publication.

The principles of the new huſbandry certainly are not to be controverted: and we are under the greateſt obligations to our countryman Mr. Tull, as his principles are very advantageouſly applicable to huſbandry in general.

* This complaint of the conduct of the Muſeum Ruſticum had too much foundation before the laſt eight months of its duration: but the direction of it then fell into my hands: and every thing which could reaſonably be deemed exceptionable, was during that time rejected. Though the former indiſcreet management, in this point, might juſtly give reaſon for ſuch a notion, yet the diſcontinuance of that work was not owing to a decline of the public favour; but merely to ſome circumſtances in the œconomical concerns, which determined the proprietors to ceaſe the publication. The ſtricteſt care will be taken to merit the compliment Mr. Howman has made to the Memoirs of Agriculture on this account. R. D.

The

The drill-method muſt certainly at preſent be very profitable in ſome particulars; but yet I muſt confeſs, that I have many doubts, whether the public would receive any advantage from the *univerſal* * prevalence of it. Sir Digby Legard very juſtly obſerves, that the compariſon is not to be made between the old and new huſbandry, but between the uſe of the drill and the broad-caſt huſbandry, according to the mo-

* The warmeſt of the rational advocates for the drill-huſbandry have never pretended that the *univerſal* practice of it in the culture of wheat would afford either public or private benefit. The Society had in view, in their premiums for the compariſon of this method with the broad-caſt, to procure ſuch experiments of its application to the culture of all the kinds of plants where there was the leaſt probability of its being advantageous, as might determine in what inſtances, and with what limitations, it might be ſubſtituted for the broad-caſt method.—Wheat being the moſt important of all grain, the attention of the improvers of huſbandry has been moſtly turned to the trials of this method on that ſubject: and the accounts already laid before the public, provide ſome foundation towards deciding, that there are particular caſes where it may be profitable both to the farmer and the public; but various others where it cannot be beneficial to either.—In the culture of beans and lucern, there ſeems already very good grounds for determining that the drill-culture is ſuperior to the broad-caſt; though the Society have, this year, continued their premiums reſpecting thoſe ſubjects.—As to turneps, there is hitherto ſuch a diviſion of opinion ſupported by ſuch a difference in the events of trials, that it requires a further extention of obſervations to conclude demonſtratively, whether in general, or under what particular circumſtances, the one ought to have the preference to the other. R. D.

dern

dern improvements adopted by the common farmer, of introducing clover, and turneps, inſtead of fallows. Therefore, though it is proved, that the drill-huſbandry exceeds any of the fallow courſes; yet it proves nothing relative to the queſtion in hand: as appears to be the caſe of the experiments of the rev. Mr. Lowther; in which, the drill method was tried againſt the common courſe of huſbandry purſued in his neighbourhood, in Cumberland: and which, ſurely, is one of the moſt wretched courſes, that ever were practiſed. Sir D. Legard, moreover, obſerves, that "the ſuperiority of one method over another is not to be determined by its advantage in a particular crop; but by many ſucceſſive ones." That is, though an acre of broad-caſt, has always, in his experiments, produced more wheat, or barley, than an acre of drilled; yet, in the full courſe of clover, wheat, turneps, and barley, (which certainly is the moſt approved courſe, and with which he judiciouſly made the compariſon), the drill is moſt advantageous. That it was moſt *profitable*, in Sir D. Legard's experiments, I readily acknowledge. But I am confident, from that gentleman's great candour in his relation, that he will not take it amiſs, if I declare my diſſent from it, as a general propoſition, that, therefore, the drill is the ſuperior *

* The word *ſuperior*, when applied to the drill-huſbandry, in the culture of wheat, compared with the broad-

ca[illegible]

method. For the public it certainly cannot be moſt profitable; whilſt it produces a leſs quantity of grain upon a given quantity of land. For then, in order to raiſe the ſame quantity of grain, we muſt take more land: and, if ſo, what becomes of our clover and turneps, the neceſſary proviſion for our live ſtock? If, on the contrary, we ſhould in the drill-way cultivate the ſame quantity of land for each reſpective crop, as we do now, then there would be a deficiency in every crop. I think, therefore, that the drill never can be pronounced to be the ſuperior method, till it can be *demonſtrated*, that it produces an equal quantity of grain, acre for acre. Then, indeed, I will acknowledge it to be vaſtly ſuperior; as there will be a ſaving of ſeed, (a great national conſideration): and a great quantity of manure may be applied to paſture-land with much profit. I do ſincerely hope, that Sir Digby Legard, who appears ſo remarkably well qualified, will perſevere in his experiments till he has clearly demonſtrated, whether the drill-huſbandry will, or will not

caſt, muſt be taken in a limited, and not an abſolute ſenſe. As far as any improvements in the drill-culture have been hitherto laid open to the world, there are more caſes where the broad-caſt would be advantageous than the drill, both to the farmer and the public: though the introduction of it in others appears to be attended with benefit to both.—So that it muſt be only underſtood to be *ſuperior*, in particular ſituations and circumſtances. R. D.

produce

produce an equal * quantity of grain upon a given quantity of land. I know he will try it againſt the beſt broad-caſt huſbandry: but I muſt take the liberty of adding, that it will not be an equal trial, unleſs the courſe of broad-caſt be cultivated by himſelf; and, in as maſterly a manner as the others, with the addition of as much of the principles of the new huſbandry, as the broad-caſt is capable of in practice †.

* According to the preſent common methods of drilling, it is evident, that the crops of wheat obtained for a number of years ſucceſſively, are by no means equal to thoſe which may be had from broad-caſt in ſingle years, with the intervention of lea, or turnep-fallows, and other favourable crops. Sir Digby Legard has given into the Society an account of further experiments, which are below inſerted; and confirm in general, the concluſions afforded by his former accounts. It does not ſeem very probable that when much leſs than half the real quantity of ground is ſown, it ſhould be made by art to afford crops as great as where the whole real quantity is ſown in the common way; except in the caſe of plants, which, requiring air to the bottom of the ſtalk, in order to their bearing well, demand intervals for their producing full crops.

But this, though true of beans and pulſe, does not hold good, in ſuch a proportion, of corn: which bears its ſeed at the top of the ſtalk; and does not require an equal expoſure to the air downwards. It is, however, ſaid, on ſome foundation of experiments, that, by leſſening the intervals in the drilling, much more than has been hitherto done, the crops may be made equal to the broad-caſt. But neither the inſtruments for this performance, nor their manner of uſe, have been made known to the public. R. D.

† There ſeems no reaſon to expect, from the nature of the ſubject, that, the greateſt improvement of broad-caſt, in the culture of wheat, on the principles, which make

I am emboldened to add this, from a remarkable inſtance, which I experienced the laſt year, of what the principles of pulverization *alone* will perform in the broad-caſt.

In the beginning of April, 1768, I ſowed three acres, part of a piece of my glebe, with white oats. It was a tolerable mixed ſoil; neither very ſtrong, nor very light; but rather ſtrong. The whole was oats, the year before: and, in order to put it in courſe with ſome other land, it was all intended for turneps. But, as I happened not to have occaſion for ſo many, I thought I might ſteal a crop of oats from the lower half:

make the drill-method beneficial, can ever render it equal for the ſame purpoſes. The end of drilling is to maintain a partial fallow continually in alternate parts of the ground, (the intervals being in the ſtate of fallow under the higheſt tillage) which may anſwer the end, and ſave in part the loſs or expence of lea fallows and manure, and become profitable on the whole, in conſequence of the continual crops obtained from the part that is ſown: which crops, though not ſo great as in the broad-caſt method, where the whole is ſown, may be yet advantageous; becauſe they are conſtant. This is, nevertheleſs, applicable with profit only in particular caſes: but, unleſs ſome improvement of broad caſt ſhould make it admit of conſtant ſucceſſive crops of wheat, it could not anſwer the purpoſes of drilling wheat in ſuch caſes. What theſe particular caſes are where the drill-method may be advantageous; as deduced from facts eſtabliſhed by experiments, according to the preſent method of practiſing it; and from what principles the reaſon of ſuch advantage ariſes in thoſe caſes, will be ſpecified and explained in the obſervations on this ſubject in a ſubſequent article. R. D.

which ſeemed to be in rather the beſt heart. Accordingly it was well ploughed three times. It was alſo twice rolled, and three times harrowed; and was thereby reduced as fine as a well-cultivated garden. The quantity of ſeed ſown was one comb per acre: or, (as I believe, that may be a provincial expreſſion) four buſhels. As this was a pretty full quantity of ſeed, I was ſurpriſed to obſerve, that it came up very thin: and I began to be of opinion, that I had done a ſilly thing, in ſowing oats after oats upon that land. For it is to be obſerved, that I had then occupied it ſix years; during which, I had not laid any *manure* whatſoever upon it: and I dare ſay it had not had much to boaſt of for many years before; being at a conſiderable diſtance from the parſonage. The oats, however, gained ground amazingly; and ſoon ſhewed, by their colour, and their branching, that they would be a remarkable large crop. And a remarkable crop they were, indeed! For they yielded no leſs than ſeventeen comb, or eight quarters and a half per acre, of fine oats. I ſhall lay no ſtreſs upon this in point of argument; as it is a ſingle inſtance. But I muſt think, it is a ſtrong preſumption, that the principles of the new huſbandry may be applied to the practice of the old, with aſtoniſhing advantage.

I have given my reaſons, why I doubted, whether the public would receive advantage

from the univerſal practice of the drill-huſbandry. I muſt now beg leave to mention, that I have ſome doubts, likewiſe, relative to the farmers profit. That the drill had a clear, and conſiderable advantage, in Sir Digby Legard's experiments, is certain; and probably, as things ſtand at preſent, would in any *particular* caſe. But, the fallacy ſeems to be this: the profit, in a great meaſure, ariſes from cultivating the ſum total of the land with grain in the drill-inſtance: whereas, the broad-caſt muſt be divided into four equal parts, ſo that the value of the grain produced by the drill, exceeds the value of the grain, turneps, and clover, produced by the broad-caſt. But this would be an impoſſibility in univerſal practice; ſome part of the land muſt be appropriated to clover and turneps: which circumſtance, perhaps, would conſiderably deduct from the difference of profit. But, beſides, if the farmer in general, deluded by preſent appearance, ſhould, by the drill, encreaſe his quantity of grain only, by the excluſion of clover and turneps, the value of the former would fall; and the value of the other muſt riſe in a reciprocal proportion: ſo that the ballance would be preſerved: and it does not appear, that any advantage would be gained that way.

Before I quit this ſubject I muſt juſt obſerve, that though I have not the leaſt objection to Sir Digby Legard's calculation; as it

appears to be made with as much candour and exactneſs as a calculation of that kind can be; yet I have one great objection to ſuch ſort of calculations in general. It is this: the ſum total of profit or loſs, in each particular caſe, muſt come out extremely different, in different counties in England, according to the different prices of labour, and to the variations in the value of the reſpective crops; and, likewiſe, of manure of different ſorts. For inſtance; the county of Norfolk is, in general, extraordinarily well cultivated. There are numerous droves of beaſts brought up from Scotland, and the North of England; and fatted here, upon turneps, for the London-market, in the ſpring. So that this is equally a grazing and a corn-country. The city of Norwich, and other large towns in the county, take off great quantities of clover. For theſe reaſons, turneps, and clover, are ſo much more valuable here, than they appear to be in Sir Digby Legard's calculation, that they would bring out the net profit much more favourable to the broad-caſt huſbandry, according to Sir Digby's own experiment. Manure, likewiſe, does not appear to be ſo dear here, as it is rated in his experiment: in ſome meaſure, ariſing, perhaps, from the quantities of cattle grazed here. If I were to add to this, that the quantity of grain, produced by the broad-caſt experiment, ſeems o fall ſhort of what is uſually produced by

ſuch

ſuch ſort of land here, I might poſſibly make the ſum-total of profit come out to the advantage of the broad-caſt. For the above-mentioned reaſons, I ſhould think it better, in ſuch experiments, not to calculate the profits in money, as it may miſlead; but only to relate the labour beſtowed, the manure expended, and the quantity of grain, &c. produced in each method: leaving to others to make out the loſs, or gain, according to the reſpective value of each article in their different ſituations *.

* It ſeems very neceſſary, for the eaſe and ſatisfaction of the reader, to ſpecify the actual expence occurring in the culture deſcribed in experiments of this kind, by giving the rate or charge of each article; and ſtating the ballance of the diſburſement and return. The greateſt explicitneſs in this point is, likewiſe, neceſſary, in order to lay thoſe concluſions demonſtratively before the public, for which the experiments are intended to furniſh the *data*, with reſpect to the comparative profit or loſs of the two methods in queſtion. Theſe concluſions depending, however, on rates, which vary much in different places, can only avail locally where a ſimilarity of circumſtances ſubſiſt. But whoever would know, how far they do hold good, or fail in any particular place, may as eaſily change the rates in the original account, and adapt them to the circumſtances of ſuch place, as if blanks had been left for them in each article.—The univerſality of the preference of the drill-culture to the broad caſt, being given up, the more particular the accounts of the profit or loſs of it in particular places, or caſes, are; and the more lights the public will be furniſhed with, for determining, where it may be tried with a proſpect of advantage; or where it appears impracticable. This both tends to the more general introduction of this culture where it may be beneficial; and to the avoiding thoſe attempts of it, where it would be fruitleſs and injurious. R. D.

I have lately had two inſtances of what Sir Digby Legard mentions, relative to the production of the honey-ſuckle or white clover, by manure, where it had never been obſerved before: the manure was very rich pond-mud; and the whole clover threw out remarkably thick. This is certainly a very great encouragemant to the applying of good manures to graſs-land. I have, likewiſe, obſerved dung well rotted to black mould, produce the ſame effect; but never in the degree * that the pond-mud above-mentioned did. In March 1767, I ſowed a ſmall quantity of the common turnep-cabbage in my garden; and in the May following tranſplanted ſome of the *beſt* plants into a corner of a field; which was dug on purpoſe. In June I tranſplanted the remaining *beſt* plants: leaving, in the ſeed-bed, only about thirty or forty plants, that did not ſeem worth removing. The corner of the field had been uſed

* I mentioned in my note on Sir Digby Legard's obſervation on this fact, in the firſt volume of theſe Memoirs, an extraordinary inſtance of it at Kedgely-moor; and ſome others, which are frequent in the county of Galway. The production, without its being ſown, of great crops of white clover; in places where none grew before, appears, as well from theſe inſtances as many others, I could cite, to depend rather on the quantity of manure than on the kind. As the ſtrange ſpontaneous ſpringing up of this plant, where it was before a ſtranger, has rarely, if ever, happened, but when manure of ſome kind has been uſed with great profuſion. R. D.

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for ſome years, as a ſtack-yard; and was much richer than the ſeed-bed. Very much to my aſtoniſhment, I ſoon found, that the ſeedlings got the ſtart of the other plants; they were, in October, at leaſt double the ſize of them. I perceive, that Sir Robert Colville has remarked the ſame thing in his letter to the Society. In November I put my cows, horſes, and ſheep, to thoſe in the field; they all fed upon them immediately with great greedineſs. I let the ſeedlings ſtand on purpoſe to ſee the effect of the froſts upon them in the winter; and was much chagrined to find, that, in one week's time, I think in January 1768, they were all reduced to a ſoft pulp. The common turneps that week ſuffered but very little, being protected by ſome ſnow. I muſt conclude that the turnep-cabbage, though * a hardier plant than the tur-

* This circumſtance of the turnep-cabbage ſuffering in froſt, which did not injure the common turnep, is ſomewhat ſingular. But the habit of plants, with relation to their tenderneſs, is very different in different places; even where no reaſon, to be collected from obſervation on the ſoil or ſituation, can be aſſigned. It is certain, that the turnep-cabbage will not endure extreme froſt in general, ſo well as the borecoles, cole-ſeed, or the newly-introduced turnep-rooted cabbage. But it appears, from many years compariſon, that it will, in moſt caſes, bear, without injury, that degree of froſt, which uſually reduces the common turnep to a pulpous ſtate, on the ſucceeding thaw: and, in ſome ſoils, it vies in hardneſs even with the above-mentioned plants. Sir Robert Colville found this hold good, with regard to a number of acres in the moſt ſevere weather of the beginning of the

nep, will ever be more liable to damage from the froſts upon account of their ſtanding ſo much above ground: which renders a much greater quantity of ſnow neceſſary to protect them, than the turneps require. Their uprightneſs, however, will make them uſeful during a great froſt or ſnow: as they may be eaſily cut up, when turneps cannot be got out of the ground without great difficulty.

A line ſignifying the receipt of this, will much oblige,

SIR,

Your very humble ſervant

Giſſing, near Diſs, Norfolk,
February 11th, 1769.

EDWARD HOWMAN.

year 1768: though, in other places, I know of, as well as with Mr. Howman, few or no plants of them remained undeſtroyed, even on a conſiderable extent of land. Regard ſhould be, therefore, had, by the former, to this local hardineſs of plants, in the choice of thoſe, which he cultivates with a view of affording food for ſheep, or cattle, in winter and the ſpring. R. D.

ARTICLE

ARTICLE V.

Further Obſervations on the Qualities, Culture, and Uſe, as well as an eſculent Plant, as in Agriculture, of the TURNEP-ROOTED CABBAGE, *or* Cabbage-turnep, *newly introduced:—and an Account of a Method of* Raiſing Melons *in Bark, without any Earth or Dung:—communicated to the* Society for the Encouragement of Arts, Manufactures, and Commerce, *by Mr.* REYNOLDS, *of* Adiſham; *and inſerted here at their Requeſt.*

To *Robert Doſſie*, Eſq.

SIR,

THE Society for the Encouragement of Arts, Manufactures, and Commerce, have directed me to deliver to you Mr. Reynold's letters, on the *Turnep-rooted Cabbage*, and his method of *Raiſing Melons*, in order to their being publiſhed in the Memoirs of Agriculture, if you think proper.

By Order,

Strand,
March 7th, 1769.

PETER TEMPLEMAN.

To Dr. *Templeman.*

WORTHY SIR, Adiſham, July 8, 1768.

ALTHO' little has been hitherto ſaid of the uſe in the kitchen-garden of the turnep-rooted cabbage, be aſſured it is very little inferior to any other eſculent plant. The herbage excels moſt, if not all, other greens for colour when boiled: and the roots ſliced help to make rich ſoup, fit for the tables of princes. —A thing worthy the notice of gardeners; eſpecially, as the greens may be cut when wanted, over and over again, as occaſion requires. Such a plant was much wanted this laſt winter: and, therefore, this is here recommended to them; and I hope will not be deſpiſed, becauſe the advice comes from a country farmer. I am ſtill at a loſs about the duration of this plant; whether it be biennial, triennial, or a perennial of longer continuance. The roots remain as firm as ever; and begin to ſhoot a-pace from thoſe plants from which the ſeed has been cut off. — This being ſomewhat extraordinary, I thought it ought not to be paſſed over in ſilence. I have nothing further to add now, ſave only, that my beſt reſpects attend the Society; and I am,

Worthy Sir, &c.

JOHN REYNOLDS.

To Dr. *Templeman.*

SIR, Adiſham, Sept. 3d. 1768.

IT gives me great pleaſure to find my account relating to the turnep-rooted cabbage meet with ſuch a good reception as to merit the thanks of that Honourable Society. My preſent deſign is to give them a more full account of my practices *, relating to this moſt excellent plant: which, I truſt, will ſooner or later become very beneficial to the whole community; and encourage every landholder, that has the means, to propagate theſe valuable roots.

As the meeting of the Society, I am informed, is near at hand, be pleaſed to lay before them for their peruſal the following letter: which, I hope, will be accepable.

My LORDS and GENTLEMEN,

GIVE me leave to ſay (and I do it chearfully too) that I am now able to preſent you with a more perfect account of the turnep-rooted cabbage, than could be done in my letter of the 13th of May 1768 †, which take as follows:

* Mr. Reynolds's former account of his firſt becoming poſſeſſed of the turnep-rooted cabbage, and of its culture and uſe, communicated by him to the Society laſt year, are inſerted in the firſt volume of theſe Memoirs. *Article* IX. p. 119. R. D.

† Mr. Reynolds alludes here to the account, before given by him, of the conſuming the product of the other

part

My *firſt* remark relates to our ſpending the remains of the growth on the five acres, viz. half an acre in May *.

This very identical bit of land maintained ſix milch-cows, one heifer, and a young bull (in all eight neat cattle) ſixteen days on the herbage part only; from which alone one hundred and ſix pounds weight of good butter were made, (a ſpecimen of which butter was ſent the Society.) My ſheep followed the courſe: and the remaining roots kept one hundred and ſixty-two teggs (ſheep of a year old) full three weeks afterwards in the greateſt † plenty. We carefully weighed

part of theſe five acres, in his letters to the Society, publiſhed in the firſt volume of his work: as mentioned in the preceding note. R. D.

* Mr. Reynolds informed the Society before, how he conſumed the other part of theſe five acres, in his letters to them inſerted in the firſt volume of this work. R. D.

† The cultivation of the turnep-rooted cabbage muſt yield great profit, if it ſhould in general prove equally advantageous, as it appears in this half acre.—Let us ſuppoſe, in order to form a cloſer judgment on it, that the maintenance of every head of neat cattle, on ſuch food, is worth one ſhilling per week; and of every ſheep, two-pence per week, as Sir Robert Colville has ſtated them in his letter to the Society, on turnep-cabbage, inſerted, page 418 of the firſt volume of theſe Memoirs. The value of feeding

	l.	*s.*	*d.*
Eight horned beaſts for ſixteen days will then be — — —	0	18	0
And of one hundred and ſixty-two ſheep for three weeks — —	4	1	0
In all —	4	19	0

This

one perch, indifferently taken, before the cows were turned in; and found the weight four hundred and eighty pounds. So that here was not leſs than ſeventeen tons of good rich food on this half-acre of land. Strange as this may appear, yet it is nevertheleſs true.

Second remark. — I find, by experience, theſe roots may be propagated with ſucceſs through all the ſummer-months, without exception, to the great advantage of the land-holder. For, ſo late as the 24th of Auguſt 1767, I drilled in a piece, after a crop of Reading-peas, with the ſeed of this plant, in two feet intervals for hoſe-hoeing: as has been before ſet forth. About Michaelmas laſt, we took away all ſupernumerary plants; and left the remaining, for a crop, eighteen or twenty inches apart in the rows. We hand-hoed all the ground: which, being duly cul-

This is at the rate of nine pounds eighteen ſhillings per acre. — Let us compute further, the expence of rent of the land, plowings, harrowing and rolling, plants, planting, and horſe-hoeing, at two pounds eight ſhillings; which is much more than is neceſſary on an average of the rates in different places; and the net profit will then be ſeven pounds ten ſhillings per acre. — This is certainly a very great gain to the farmer, who ſcarcely more than clears his expence by a common crop of turneps. The public would, alſo, if the premiſes ſhould on future experience be found true in general, receive equal benefit from the extenſive cultivation of this plant. As it would afford a ſecurity againſt the effects of very ſevere ſeaſons: which deſtroy a conſiderable part of the neat cattle and ſheep; and occaſion a ſcarcity for ſeveral ſucceeding years. R. D.

tivated

tivated afterwards, produced plants, the third of May, of the weight of four pounds in common; and ſome of five pounds weight. A few of theſe ſtood for ſeed: which turned out equally good in kind, as thoſe raiſed in April: only with this difference, that the ſeed came about eight days later. This is a ſufficient proof of what was before aſſerted; that theſe roots may be propagated through all the ſummer-months with good ſucceſs; and, I may add, with good profit too.

Third remark.—Would not the man deſerve ample reward, who ſhould point out ways and means, whereby our cattle may be always fully ſupplied with good ſtore of winter-food: and that of the very beſt kind too?

I dare venture to affirm this great good may be obtained without any extraordinary difficulties, either in labour, or expence; and yet, by means the leaſt thought of, as I believe.—The thing lies before us, however long overlooked. It is this very identical plant, I am now treating of: which is certainly adapted for this wiſe purpoſe: and we ſhall ſee, by and by, that properly cultivated and duly managed, it will moſt effectually anſwer this moſt deſirable *great great end.*

And here, gentlemen, let me crave your attention, whilſt I unfold how this may be done, by means not founded on a chimerical notion: as may be gathered from thoſe facts, which

which the experiments already made evince, viz.

We ſee it is certain, the product of this plant is very * great.

We ſee, likewiſe, with the ſame certainty, that the roots may be conſtantly raiſed, for any occaſional ſupply, through all the

* On enquiring of Mr. Reynolds, how far he has found the ſame advantages, he here deſcribes, attend the crops of turnep-rooted cabbage raiſed by him the laſt ſeaſon, he declared himſelf confirmed by them in the obſervations here given. This very copious product is, however, doubted by ſome: who aſſert, that the crops, they have produced from his ſeed, have had ſmaller roots; and yielded much leſs, on the whole, than he here relates to have obtained from thoſe he cultivated. They, conſequently, infer hence, that this kind is not ſuperior to the common turnep; though, according to his mode of culture, the expence of a crop is much greater. But no ſtreſs ſhould be laid on the product of any plant from a few particular inſtances. For the effects of ſoil, and other incidental circumſtances, are ſo various on many kinds of plants, eſpecially the *braſſica*, or turnep and cabbage tribe, that no certain concluſions can be drawn from ſingle trials. Mr. Reynolds's land was far from rich: and yet the ſpecimens he produced to the Society, verified entirely what he ſaid of the magnitude of the roots of this plant. The herb itſelf, as it will bear cropping ſeveral times, affords a conſiderable quantity of good food: and the root is evidently more nutritive than the common turnep. The produce muſt, therefore, be juſtly ſuppoſed much greater, on the whole, on any land which is adapted to the plant: and the certainty, that the crop will not be deſtroyed by the moſt ſevere froſt, together with its continuance, when ſuffered to ſtand, even through the whole ſpring as well as winter, renders this plant of great utility where there is a proſpect of ſcarcity of paſture and fodder in the ſpring. R. D.

ſummer-

ſummer-months; and may be had too in any quantity, ſowing them duly.

We ſee, alſo, that the roots, when raiſed, are very durable: moſt excellent food for cattle: and not liable to be deſtroyed by froſts, as other greens are.

Now what more can be deſired, than a ſkillful application in the culture? The *materials* I will point out.

The farmer has nothing more to do than ſow a little bit of land, on a gentle, good, warm ſoil, with the ſeed, about five weeks before-hand; to be in readineſs againſt his land is prepared to receive the plants. How to manage that has been already told. Nevertheleſs, as the very beſt methods are liable to accidents, ſhould a ſecond ſowing be neceſſary, the ground is to be ſtirred again firſt: otherwiſe the ſeeds will not lie deep enough to maintain their growth. An error in this point is, by the bye, one reaſon, why my brother farmers often loſe their turnep-crops. For it is an ill-grounded opinion, that turnep-ground ſhould be made *fine* before ſowing. As the ſowing them after the plough is confirmed, by experience, to be beſt.

But to return.—In caſe food be wanting in or before December, ſow the beginning, or about the 10th of April: and the plants will be ready in May for planting out.

Sow, for ſpring-food, as occaſion may require,

quite, in any other month. Rye, peas, and white oats, generally come off in July. After any of theſe crops, the turnep-rooted cabbage may be planted with ſucceſs aſſuredly, if the land be dry.

To confirm this, I have at preſent two very promiſing pieces lately planted after peas and oats. The ſeed, from whence the plants were raiſed, was ſown the 15th of July laſt.

And we have, moreover, the experiments before-mentioned to aſſure us, that even ſowing in drills, without tranſplanting, ſo late as the 24th of Auguſt, will ſucceed; and much outdo any crop of common turneps. But the other method, or tranſplantation, is undoubtedly beſt * to be purſued.

Now here is confirmation enough, with evidence, to prove, that we may always have

* The preference of tranſplantation of the turnep-rooted cabbage to ſowing in drills, or broad-caſt, and hoeing out the redundant plants, is ſtill more confirmed, by the obſervations, which Mr. Reynolds has made ſince the date of this letter, according to the verbal accounts that he has given.—The expence of tranſplanting, he has below informed us, was found by him to be at the rate of ſeven ſhillings per acre, after his people were ſomewhat accuſtomed to the performance of it: allowing one ſhilling and ſix pence per day for each man employed. From theſe ſeven ſhillings, we muſt deduct the expence of hoeing an acre to thin the plants: which would of courſe be incurred, if they were ſown where they are to ſtand. Hence the difference of the expence of tranſplantation from that of the other method appears inconſiderable; and it muſt conſequently be eſteemed the beſt practice, if the crop produced be materially greater from it. R. D.

a conſtant ſupply of good winter-food for our cattle in abundance, if we be ſo minded. And he who is negligent in procuring of it, is unpardonable (when the means are known.)

The ſhort of the matter is this: to keep a ſtock of theſe ROOTS in readineſs to ſet out as ſoon as the crops come off; or to plant on fallows: as may be moſt convenient to the farmer. The larger-ſized plants, we find do beſt: the ſmaller are not ſo deſirable; becauſe the ſun injures them moſt.

Horſe-hoeing is abſolutely neceſſary to bring the plants to perfection: as has been taught before.

I ſee no difficulty in the performance of this great work: nor am I aware of any objections, that can reaſonably be made againſt it. But, on the contrary, we have the very beſt to hope from the fruits of our labours: and the practice of it is very natural, common, and eaſy to underſtand. The expence is little, compared with the product. For I find now my men are become expert, we can plant at ſeven ſhillings per acre: allowing one ſhilling and ſix pence per day for each man.

By this practice, the farmer runs no hazard of ſowing whole fields at a venture; as he muſt do in turnep-culture; nor loſes any crop of corn: and, what is material too, much leſs land will maintain the ſame ſtock, I am confident.

fident. For one acre of theſe roots, that grew laſt year, was worth any two of common turneps; which I ever was maſter of, for theſe forty years paſt: and it will be allowed, that my turnep-crops have not been inferior to thoſe of any others whatſoever in Kent.

In the caſe before us, we have a great deal of time for ſowing and planting at pleaſure: and, what is more, we have a choice of the kind of land, indeed the greateſt, for this purpoſe. Since it is certain this plant will produce a good, nay, a great burden, where common turneps will fail; and come to nothing. This appears undeniably true from fact.

Miſtake me not, however.—I would, by no means, throw the common turneps aſide. They have their uſe truly ſtill. But the roots, I am treating of, are greatly more copious in quantity; more firm, ſolid, and durable; and may be had when turneps fail. What a noble ſubſtitute then is here before us ready at hand, at all times, and all ſeaſons too, to ſupply our wants, even in the moſt rigorous froſts.

I am, my Lords and, Gentlemen,
with all dutiful reſpect,
your dutiful obedent ſervant truly,
JOHN REYNOLDS.

Mr. REYNOLDS' New Method of raiſing Melons, as communicated to the Society.

Prepare a bed of caſt tanners bark, about four feet deep, ſix feet wide, and twelve feet in length within-ſide the frame; to be covered with four ſaſh-lights when finiſhed. No rain, or water, is to be admitted, by any means: for that will hinder the ſweating and heat of the bark.—This bed is to be prepared about a month beforehand for receiving the ſeed: and March will do well for this purpoſe for private uſe. —When the bed becomes warm (which generally happens in about twenty days, or little more) a few ſeeds are to be ſteeped in a little warm milk, in a tea-cup, or ſmall earthen veſſel; and plunged into the bark-bed for about thirty-ſix hours, to promote its vegetation. Then open four holes in the bed, at equal diſtances, of nine inches diameter, and about five inches deep: having in readineſs about a peck of pounded bark (ſaw-duſt like) to place at the bottom of the holes, three inches thick. On this place the ſeeds: preſſing them with the finger a little. This done, cover the ſeeds two inches thick with the ſame powder of bark, as was put at the bottom: preſſing it down cloſe with the hand. This is all that is needful to be done in planting; and is all eaſy enough.

When

When the plants are advanced to a proper ſize, make choice of the beſt; and take the others away, at pleaſure, as the caſe requires: giving them proper pruning, and as much warm air, as poſſibly can be, through the ſummer: as is done in the common methods.

By this practice, I have, for ſeveral years paſt, raiſed as good melons of divers kinds, as were ever brought to table: and that without earth, dung, or water.

I really think the fruit of the melon-plants, ſo managed, is better-taſted than that of thoſe raiſed on ſtinking dunghills; and, perhaps, more wholeſome too.

I have pleaſed myſelf greatly by this new method; and flatter myſelf, it will meet with a candid reception among the learned ſons of agriculture, gardeners, &c. for whom I entertain a great veneration.

P. S. The glaſs-frame is to be covered at nights, and in cold days, with a matt during the cold ſeaſons.

N. B. By this method we are not annoyed by any worms, ſnails, or inſects whatſoever: which is more than can be ſaid for the common practice.

ARTICLE VI.

Account of Experiments, to determine the comparative Advantages of the Drill and Broadcaſt Huſbandry; communicated by Sir DIGBY LEGARD *to the* Society for the Encouragement of Arts, Manufactures, and Commerce, *and inſerted at their Requeſt.*

To *Robert Doſſie*, Eſq.

SIR,

THE Society for the Encouragement of Arts, Manufactures, and Commerce, have directed me to deliver to you Sir Digby Legard's Comparative Account of the Culture of Wheat, in order to its being publiſhed in the Memoirs of Agriculture, &c. if you think proper.

Signed by Order,

PETER TEMPLEMAN.

The

The following EXPERIMENTS on the Cultivation of Wheat, are humbly offered to the Society for the Encouragement of Arts, Manufactures, and Commerce.

AS a candidate * for the honorary premium offered by the Society, for an account of the moſt profitable method of cultivating wheat, I here ſend you this year's experiments on that grain, together with the hiſtory of the actual produce of ſeveral fields ſown, in different years, on various ſoils, and in three different methods: viz. Broad-caſt; —drilling in equidiſtant rows; — and drilling on beds, horſe-hoeing the intervals.

In the laſt method, the land is plowed into ridges of about five foot broad. Two rows, or more, are drilled on the ſummit of every ridge; and the intermediate ſpace, or interval, betwixt each pair of rows is left unſown, to admit of the plow, or horſe-hoe. Thus the land is tilled, whilſt the crop is actually growing: and, by this tillage repeated often, and at critical times, it is intended, that the roots of corn, &c. may be enabled, without dung, to find a ſupply of food requiſite

* The premium, claimed by Sir Digby Legard, for this account, was the gold medal of the Society: which was unanimouſly adjudged to him. It is the ſecond obtained by him, for communications on this ſubject: the former particulars of which are inſerted in the *firſt volume of theſe Memoirs.* R. D.

to the perfection of the plants. — But this is not the only advantage propoſed. — All kinds of weeds, that grow in the intervals, are to be ploughed up before they have time to exhauſt the land, or ſhed their ſeed:—the ſmall places betwixt the rows are to be hand-hoed: — and the rows themſelves weeded. A proper inſtrument ſets the ſeed-corn at the depth required; and in any deſired quantity: by which regular diſtribution, a third part of the ſeed, uſed in the common way, is ſufficient to ſow an acre in this: and it is preſumed, that the wide intervals of four feet, by the free admiſſion of the ſun and air, enable the ſtalks to grow ſtronger; and the grain to ripen more perfectly. It is further aſſerted, that this mode of culture does not exhauſt the land: — that the ſoil is kept in heart as well as in tilth: — and that, without manure, wheat may ſucceed wheat in infinite ſucceſſion.

The method of drilling corn in equidiſtant rows, without any intervals for horſe-hoeing, is a middle way betwixt broad-caſt ſowing, and horſe-hoeing. The benefit intended by this method is directed to the ſaving of ſeed, half the uſual quantity being ſufficient;—the diſtributing that ſeed more regularly, both as to depth and diſtance;—and the admitting of hand-hoeing: a very uſeful operation; and which the regularity of the rows, in this mode of culture, makes quite convenient.

The

The methods of broad-caſt ſowing are various; but too well known to need any particular deſcription. Wheat is ſometimes ſown under furrow, and ſometimes harrowed in. It follows clover, beans, or peas, &c; or is ſown on fallow, juſt as it may ſuit the land, or the convenience of the occupier. But, unleſs the ſoil be extremely rich, it requires a great quantity of manure, as well as a perfect tilth.

As wheat occupies the land longer than other grain, it naturally requires a larger ſupply of nouriſhment: and, being the beſt in quality, and moſt coſtly of all grain, no farmer grudges to beſtow his beſt land, his richeſt manures, and his utmoſt care upon it.

One of thoſe three methods, above deſcribed, of cultivating wheat, is probably the beſt.

But as there are advocates for each, and the debate is very intereſting, I have poſtponed giving you my ſentiments on this important ſubject, till, by reaſon, obſervation, and experience, I might be enabled to offer ſomething preciſe, and determinate. Having, however, now had ſeveral years practice in the drill-culture, I ſend you the reſult of that practice, as far as relates to the cultivation of wheat, extracted from my minutes: and, to avoid the imputation of partiality to a favourite ſyſtem, I muſt premiſe, that, during the ten years, I have purſued the horſe-hoeing culture, I have conſtantly attended the common

mon method; and have generally even practiſed the latter on fields contiguous to thoſe deſtined for the Tullian, or garden-cultivation. True it is, that where the new method is carried on in a neat, and huſband-like manner, the fields reſemble a garden in the elegance of their appearance, and the luxuriance of their productions. Whether, or no, the preference be really due to this ſyſtem, or it ever will be generally adopted, time and experience muſt diſcover. All the light, we can reaſonably expect in this dark ſubject, the Society has wiſely given, by calling for a comparative view of the advantages and diſadvantages attending each peculiar method of culture, confirmed by experiments. By thoſe, which, I am about to relate; and in which I ſhall be careful to remark every ſtriking circumſtance, it will appear to which method, I give the preference. I propoſe to ſtate the expence and profit of each; and, after every experiment, to add ſuch obſervations and reaſonings, as naturally occur. If, upon the whole, the new huſbandry ſhould appear, from my experiments, to be moſt advantageous; yet, in different ſoils, ſituations, and circumſtances, others may be in the right to prefer the beaten roads: and even taſte will influence many, to purſue the ſame end by different means. Farmers are induced to continue the routine of random ſowing; whilſt gentle-

men

men adopt the more elegant entertainment of a garden culture: the firſt, content to tread the dull round preſcribed by their forefathers; the laſt indulging their fancy in a more pleaſing variety. Nor is it unjuſt, that the moſt ſure and even road ſhould be trod by the induſtrious huſbandman, on whom, both his own family, and the nation, muſt depend for bread: whilſt men of fortune, in the pleaſing, but dangerous avenues of experiment, are ſometimes mortified with diſappointment, and loſs; or, at other times, elevated with uncommon ſucceſs. And, as gentlemen are the moſt proper to make experiments, ſo are they moſt likely to ſtrike out capital improvements: which, when ſufficiently eſtabliſhed by long and conſtant ſucceſs, ought then, and not till then, to become the univerſal practice.

Tull was the firſt, in this country, who introduced, and continued in an extenſive manner, the ſcheme of ſowing corn regularly in rows; and tilling the land within reach of its roots, in order to encreaſe its growth. His idea was ſenſible; and was found to anſwer in practice. His ſcheme gains ground in ſeveral foreign parts; but, though many have tried it here; and even approved it; yet few, if any, have had the reſolution to perſevere. But I flatter myſelf, that the following experiments, which are no more than a plain relation of facts, will evince the reaſonableneſs

of

of the ſcheme, and the great advantage attending it.

On the 8th of October, 1758, one acre was drilled with common white wheat, called Lammas, on ridges five foot broad. A double row was ſown at the top of every ridge: the partitions being eleven inches. Conſequently, the intervals for horſe-hoing were four feet one inch. The ſeed was moiſtened, and limed: and the quantity uſed was about two pecks. The plants were hand-hoed once; and horſe-hoed three times: and the produce, when thraſhed, was one quarter, four buſhels.

Observations on the above Experiment.

The field, in which this corn grew, is an incloſure of about ſixteen acres, and nearly ſquare; tolerably well ſheltered, particularly on the eaſt-ſide, by trees and hedges. The ridges run eaſt and weſt. The ſoil is light, dry, deep, and friable: about ſix inches of ſoil have been uſually ſtirred with the plough. This ſoil is a hazle mould, accounted good barley land; but ſcarce ſtrong enough for wheat. This field, whilſt in graſs, was rented at ſixteen ſhillings per acre; but is no better than the neighbouring fields in tillage, let for twelve ſhillings. I have been the more particular in the deſcription of this ſoil, &c. be-

cauſe

cauſe ſeveral more of the experiments, which follow, were made therein: and I think it highly neceſſary, that every circumſtance of that kind ſhould be carefully attended to. This acre had borne three ſucceſſive crops, viz. firſt, oats; on once ploughing the ſwarth or ſod: ſecondly, barley, on two ploughings: (N. B. The two laſt crops were very good ones, and were ſown broad-caſt:) thirdly, peas drilled, and horſe-hoed; which was alſo a good crop. The fourth crop, being wheat, as above related, and producing one quarter four buſhels, cannot be eſteemed a bad one: but it would have proved better, if rightly managed. One fault committed was the ſowing too little ſeed: which was occaſioned by the lime's * clogging the notches of the ſpindle of the drill. Tull's laſt-improved two-wheeled drill-plough is the inſtrument, I generally make uſe of: and, I think, three pecks to an acre is the leaſt quantity of ſeed required. The expence, and profit on one

* The method of brining wheat, with a ſolution of common ſalt and lime, communicated to the Society for the Encouragement of Arts, &c. and inſerted below in this volume, perfectly anſwers the end of liming; and avoids that very great inconvenience in drilling, which attends the uſe of lime in ſubſtance. The clogging the inſtrumment, as here mentioned, by lime, has been one very ſtrong impediment to the ſucceſs of experiments on the drill-culture. As it neceſſarily prevents the equal depoſit of the ſeed in the furrow: on which, in a material degree, the quantity of corn produced, depends. R. D.

acre of horſe-hoed wheat, ſo cultivated, will be nearly as follows:

	£.	s.	d.		£.	s.	d.
One ploughing from the ridges, — —	0	4	0	One quarter four buſhels, product, at 5s. per buſh.	3	0	0
One hand-hoeing, — —	0	2	6				
Three horſe-hoeings, at 1s. 2d. each, — —	0	3	6	Deduct expences —	1	9	9
Three pecks of ſeed, at 1s. 3d. per peck, —	0	3	9				
Drilling *, reaping, and carrying, — —	0	4	0	Remains clear profit —	1	10	3
One year's rent of one acre,	0	12	0				
	1	9	9				

* It has been uſual to omit the expence of reaping, and carrying home the corn, in theſe accounts; becauſe the value of the ſtraw, which is alſo omitted in them, is ſuppoſed to counter-ballance thoſe articles. This expence is, however, charged here, without any allowance, in the account of produce, for the ſtraw. There is not, however, the leaſt impropriety in ſo doing: as this ſtate is given with a view only of making a *comparative* eſtimate of the profit in the three modes of cultivation: and the ſame omiſſion is made in the charges of product reſpecting all of them: which renders the matter equal as to the *compariſon*. But, as the value of the ſtraw is a real part of the return, it is proper to allow for it, if no equivalent ſet off be made in the expences, when a computation is made of the *abſolute* profits of any of the three modes of culture. To apply this to the drill-huſbandry: if we allow three ſhillings for the ſtraw, a drilled acre according to the reſult of the experiments before us, will afford one pound thirteen ſhillings and eight-pence clear profit: which furniſhes an additional encouragement, to the uſe of the drill-method, that renders the conſtant cultivation of wheat on the ſame land practicable. R. D.

On

On the 25th of October, 1759, four acres were drilled with common white wheat, on five foot ridges, in eleven partitions, in the ſame field, after a crop of barley; and took one buſhel and three pecks of ſeed, managed as before related. The produce was four quarters five buſhels. This was a poor crop: owing chiefly to too late ſowing, and uſing too little ſeed. The ſeaſon being ſo far advanced, four pecks to an acre would not have been too much. The plants ſtood very thin in the rows. The hand-hoeing was not performed with care: and the fourth horſe-hoeing was omitted; whereby many weeds ſprung up to the detriment of the crop. This was the ſecond ſucceſſive crop.

The ſame four acres were again drilled with wheat in the beginning of October, 1760, managed as before-mentioned, and two buſhels of ſeed was ſown: which yielded ſeventy-ſix ſtocks; or five quarters three buſhels. This was the third ſucceſſive crop: and the produce was twenty-one fold.

It may be obſerved, that the crops of the two laſt experiments were inferior to the firſt, although raiſed in the ſame field, and where the ſoil was equally good. The reaſon, I have in part given. Moreover, the ſeaſons were not quite ſo favourable.

It cannot be urged, that the riches of the ſoil were exhauſted: becauſe the four acres in queſtion do not comprehend that

particular acre, firſt-mentioned. Beſides, the laſt crop was better than the preceding one, on the ſame land. Every farmer knows, that ſome years are particularly favourable for wheat: and that other years are averſe. Yet every one may not be able, to aſſign the direct cauſes of each year's failure, or of each year's ſucceſs. Manifeſt inclemencies of ſeaſons, ſuch as hurricanes, &c. are obvious to every eye: but there are unſeen and ſecret cauſes, that operate towards the deſtruction of crops; which are not the leſs ſure for being unnoticed. The worm, which preys upon the root, is an enemy of as much conſequence, as the bird, which devours the ear. An open attack is leſs dangerous than a ſecret conſpiracy.

October 1761, three acres three rods, part of the ſame land, was again drilled with wheat; and, in like manner, hand-hoed, and horſe-hoed as before. The quantity ſown was two buſhels. Seventy-two ſtocks were reaped: which yielded five quarters. This was the fourth ſucceſſive crop: yielding twenty fold.

Some of the ſame faults were committed now as before. The chief was diſpenſing the ſeed too ſparingly. This would have been prevented, if I could, myſelf, have attended the operation of ſowing.—The ground was under-ſtocked with plants of wheat: and, in their room, the weeds intruded themſelves: which

which exhauſt the moiſture, and rob the uſeful plants of nouriſhment. This crop was nearly of equal goodneſs with the preceding.

February the 26th, 1763, one acre and half was drilled with wheat on one ploughing, after a crop of turneps, which was eaten off by ſheep. The beds were hoed as uſual: the quantity of ſeed ſown was four pecks: which was firſt ſteeped for thirty-ſix hours in ſalt and water; and limed. The produce, when threſhed, was one quarter two buſhels. This was a poor crop: as ſpring-wheat generally is. However, it was the fourth ſucceſſive one: yielding ten-fold.

In October 1763, five acres, one rod, twenty-four perches, were drilled in the ſame manner with wheat; and took a ſomewhat larger allowance of ſeed, viz. three buſhels, three pecks. This corn was managed as uſual; cut the 26th of Auguſt, 1764; produced one hundred and twelve ſtocks; and when threſhed, yielded nine quarters ſix buſhels. It was the ſixth ſucceſſive crop. The ears of this corn were remarkably large, and well filled with grain; and contained, at a medium, forty grains in each ear. The rate of increaſe was above twenty fold.

September the 19th, 1764, ſeven acres were drilled on the ſame land, in the ſame field. Six buſhels, two pecks of ſeed, were uſed: which produced ten quarters. The rate of increaſe here was nearly thirteen fold; and

the ſeventh ſucceſſive crop. Part of this field was drilled with my own wheat, which grew on the ſame land; and part with the wheat produced from a ſtrong clay, at a diſtance. Part of the ſeed was limed; and part unlimed. But I could not perceive any material difference, either in the growth, or produce, betwixt one part and another. A buſhel of this corn weighed, in January, ſixty pounds.

In October, 1765, the ſame ſeven acres were again drilled with wheat as above; took five buſhels three pecks; and yielded ſix quarters five buſhels: or above ten fold. This was the eighth ſucceſſive crop. But this year was bad for wheat: and the drilled crops ſhared the fate of others.

On the 18th of September, and 22d of October, 1767, ſeven acres and a half, in the ſame field, were drilled again with wheat, as before; and took ſeven buſhels of ſeed: ſix of which were white lammas, from a ſtrong clay at twenty miles diſtance: and one buſhel was Smyrna wheat; otherwiſe called Sicilian, or cluſter-eared. The repeated hand, and horſe-hoeing, had the uſual effect on this crop: viz. to make it branch greatly; and to render the plants of a deep green colour, ſtrong, and vigorous; and the ears large, full, and heavy. The quantity of ſeed proved ſufficient: whereby the whole field was compleatly ſtocked: and, the ſeaſon proving kindly, this crop was perfectly beautiful, free from weeds,

weeds, and of a moſt promiſing aſpect: all, except the one acre and half of Smyrna wheat. The ſeed there had not been good: and too little of it had been ſown: wherefore it ſtood much too thin on the ridges. In other reſpects, the plants were extremely fine; and the ears well filled; and it ripened perfectly. N. B. This acre and half had been dunged the year before. This crop was cut, and led in the beginning of September laſt; and produced as follows: viz. ſix acres of white wheat, which took ſix buſhels of ſeed, produced one hundred and nineteen ſtocks: or nine quarters three buſhels. The acre and half of Smyrna wheat, which took one buſhel of ſeed, produced twenty-two ſtocks: or one quarter, five buſhels, two pecks. The white wheat is remarkably clean, fair, and plump: and the bread, &c. made of it, which have been conſtantly uſed in a large family for ſome months paſt, have been acknowledged of the very beſt quality. On the contrary, the Smyrna wheat, though the ear contain more grains, and thoſe are larger, yet the bread is much inferior: being neither ſo light, nor fair. The miller, however, obſerved, that this corn yielded more flour than the common ſorts: but it was gritty to the touch: as the grain was remarkably hard. Poſſibly the common mill-ſtones may not have power to grind it perfectly. This being my laſt experiment in the hoſe-hoeing method, I muſt

remark, once for all, that every crop, except the acre and half of Smyrna wheat, was raiſed without dung: nor was that acre and half dunged for wheat; but for the preceding crop: part of the land being of very inferior quality. Moſt of theſe crops ſucceeded each other on the ſame land: and the laſt was the ninth. I expected, indeed, a greater increaſe: but a good deal has been waſted, by rats and other vermin. However, the rate of increaſe is about thirteen fold from the common wheat: and one quarter four buſhels, two pecks, to the acre; and above ten fold from the Smyrna wheat; or one quarter one buſhel three pecks per acre. N. B. The ſame land is again drilled with wheat, the tenth ſucceſſive crop.

EXPERIMENTS *on Wheat drilled in equidiſtant Rows.*

October the 9th, 1762, four acres and a half were drilled with wheat in rows, one foot diſtant and no interval, on one ploughing after clover. The ſecond crop of clover on half this land was plowed in: and the remaining half was well-manured, viz. twenty loads of dung to an acre. The ſeed was ſteeped twenty-four hours in ſea-water; and then limed. The quantity ſown was four buſhels two pecks. The whole of this land was hoed the following ſpring: which was

of

of manifeſt advantage to the crop. But the dunged and undunged parts ſeemed of equal goodneſs. This corn was threſhing in February, 1764; and produced ſeven quarters ſix buſhels, one peck: which is nearly one quarter ſix buſhels, to an acre, or nearly thirteen fold.

The Expences here are as follows, viz.

	£.	s.	d.
Forty-five load of dung, at 2s. — —	4	10	0
Value of the ſecond crop of clover ploughed in	1	2	6
One ploughing, at 6s. per acre — —	1	7	0
Four buſhels two pecks of ſeed, at 5s. per buſhel — — —	1	2	6
Harrowing and reaping, at 6s. per acre: hand hoeing, at 3s. per acre —	2	9	6
Rent of four acres and half, at 12s. per acre -	2	14	0
	13	5	6

	£.	s.	d.	
The value of ſeven quarters ſix buſhels one peck, at 5s. per buſhel, is — —	15	11	3	
From which if we deduct the expences — —	13	5	6	which is 10s. per acre, net profit.
	2	5	9	

October the 20th, 1764, two acres were ſown by hand with white wheat: viz. an acre and half on a rich old paſture, on once ploughing the ſod: and half an acre on wheat ſtubble. The ſeed uſed was four buſhels two pecks. At the ſame time, three acres adjoining were drilled in equidiſtant

rows one foot aſunder; and took four buſhels one peck. The preceding crop was oats; and the land was twice ploughed ſince harveſt, to deſtroy the ſcattered ſeed.

	q.	b.	p.
The two acres ſown by hand, yielded —	5	2	2
The three acres drilled in equidiſtant rows, yielded	8	7	3

	q.	b.	p.	
The former is —	2	5	1	per acre,
The latter is —	2	7	3	per acre

	£.	s.	d.
Value of the crop on the three acres ſown by hand, at 5s. per buſhel —	10	12	6
Deduct for ſeed, expences, and rent —	3	16	6
Profit —	6	16	0
Value of the crop on the three acres drilled in equidiſtant rows —	11	18	6
Deduct for ſeed, expences, and rent —	5	8	
Profit —	12	10	6

REMARKS on the above.

The ſeed of the drilled part was not limed: but I could not perceive any inconvenience from that omiſſion in this experiment. Yet, at other times, I have thought the crop has ſuffered by being unlimed; either from the ſeed's being unprotected from vermin by a ſuperficial covering; or by being more liable to ſmut.

Though no manure was actually uſed in the above experiments, the land being freſh, and in good heart, it will not be unfair to charge

charge ſomething on that account. Becauſe this crop of wheat (a large one), exhauſted the land; and made it abſolutely neceſſary to uſe manure for the ſucceeding crop of barley: which a horſe-hoed crop would not have required. I, therefore, muſt deduct for the value of fifteen load of dung to an acre: and then the net profit

	£.	s.	d.		£.	s.	d.	
On the two acres ſown in broad-caſt, is —	3	16	0	or	1	18	0	on each acre.
On three acres drilled, net profit — —	8	0	6	or	2	13	6	

September the 1ſt, 1764, two acres and a quarter of poor land, but freſh, and limed with one chaldron to an acre, having been thrice ploughed after oats, were drilled with wheat in equidiſtant rows; and took four buſhels of ſeed. The produce was three quarters five buſhels.

This was a middling increaſe, being about ſeven fold.

	£.	s.	d.	
The value of this crop is — —	7	10	0	
The expences — — —	6	0	0	
The net profit — — —	1	10	0	
The net profit is here — —	0	13	0	per acre.

In October 1766, two acres and a quarter were ſown in broad-caſt, on clover-ſtubble, with five buſhels two pecks of ſeed; and yielded, in Sept. 1768; ſeventy-four ſtocks of corn. Each ſtock produced a buſhel of wheat:

which is above four quarters to an acre. I have this account from a neighbouring farmer, who ſowed this wheat on his beſt land; and he aſſured me, this was the largeſt crop that ever grew on it. He uſed twenty load of dung to an acre.

	£.	s.	d.
The value of which was — —	4	10	8
Seed, ploughing, weeding, reaping, and rent -	4	10	0
	9	0	0
The value of the crop 18 *l.* 10 *s.* Expences 9 *l.* Net profit —	9	10	0

The acreable produce is four quarters. The rate of encreaſe is twelve fold. I ſhall here end my account of experiments: and, before I proceed with my obſervations thereon, I cannot help remarking, that were the comparative advantages of the drill, and broad-caſt huſbandry, to be eſtimated on the footing of this crop of wheat, the ſcale would undoubtedly preponderate in favour of the common method.

I have always been of opinion, that no ſingle crop of horſe-hoed corn, could ſtand in competition with a field in broad-caſt. But it is not our buſineſs to examine the partial advantages of a ſingle year; but the real advantages of a courſe of tillage, extended to four or five years; and the preference is, I truly, due

true to that method, which, at the end of such a course, yields the fineſt and moſt corn, obtained at the leaſt coſt.

By way of recapitulation, I here give, at one view, a table of the experiments.

NEW HUSBANDRY.

Years.	A. R. P.		Seed ſown. Q. B. P.	Produced. Q. B. P.	Rate of encreaſe.
1758	1 0 0	Wheat horſe-hoed	0 0 2	1 4 0	24 fold
1759	4 0 0	Ditto	0 1 3	4 5 0	20 fold
1760	4 0 0	Ditto	0 2 0	5 3 0	21 fold
1761	3 3 0	Ditto	0 2 0	5 0 0	20 fold
1763	1 2 0	Ditto ſown in Feb.	0 1 0	1 2 0	10 fold
1763	5 1 24	Ditto ſown in Oct.	0 3 3	9 6 0	20 fold
1765	7 0 0	Ditto	0 6 2	10 0 0	13 fold
1766	0 0	Ditto	0 5 3	6 5 0	10 fold
1767	6 0 0	Ditto	0 6 0	9 3 0	13 fold
	1 2 0	Ditto Smyrna wheat	0 1 0	1 5 2	13 fold
	41 0 24		3 6 1	55 1 2	

OLD HUSBANDRY.

			Q. B. P.		
1762	4 2 0	Drilled in equi. rows	0 4 2	7 6 1	13 fold
1764	2 0 0	Sown broad-caſt	0 5 0	5 2 2	8 fold
1764	3 0 0	Drilled in rows	0 4 1	8 7 3	17 fold
1765	2 1 0	Drilled in rows	0 4 0	3 5 0	7 fold
1767	2 1 0	In broad-caſt	0 5 2	9 2 0	12 fold
	14 0 0		2 7 1	34 7 2	

q. b. p.	acres	q. b.	l. s. d.
34 7 2 being the produce of	14, is near	2 4 per acre, worth	5 0 0
55 1 2 ditto	41, ditto	1 3 ditto, ditto	2 15 0

As, from the above experiments, we have been able to obtain the medium acreable produce, both in the old and new huſbandry, I ſhall in the following calculation ſtate the crops

crops in each according to thoſe data. And I am confident, that, in ſo doing, I give an advantage to the old method, which it is not entitled to. For I have mixed the accounts of crops drilled in equidiſtant rows, with the crops in the old huſbandry; of which, in fact, they are no part. Now that method of ſowing both takes leſs ſeed; and conſtantly produces a greater crop: nor do I think tht the medium acreable produce would be ſo great otherwiſe. Therefore, if, by this compariſon, the new huſbandry proves moſt advantageous, there is no doubt but that, in other caſes, it will prove ſtill more ſo.

I ſtate the ſtanding expences on one acre of horſe-hoed wheat at one pound eight ſhillings; and the expences on broad-caſt, of the four ſeveral years of the courſe, according to the price of labour and manure in theſe parts.

	Drill Husbandry.				Broad-cast Husbandry.				
Y.	Acres.	Produce.	Expences	Net prof.	Y.	Acres.	Produce.	Expences	Net prof.
		q.b.p.	l. s. d.	l.s.d.			q.b.p.	l. s. d.	l. s. d.
1	1 Wheat	1 3 0	1 8 0	1 7 0	1	1 Wheat	2 3 3	3 9 0	1 10 0
2	1 Wheat	1 3 0	1 8 0	1 7 0	2	1 Turneps	35 tun	3 0 0	0 0 0
3	1 Wheat	1 3 0	1 8 0	1 7 0	3	1 Barley	4 0 0 0	1 8 0	2 12 0
4	1 Wheat	1 3 0	1 8 0	1 7 0	4	1 Clover	3 tun	1 0 0	0 10 0
4	4	5 4 0	5 12 0	5 8 0	4	4.		8 17 0	4 12 0

I appeal to common experience for the truth of the account above, in common practice:

tice: and the ſoil in queſtion being peculiarly adapted to turneps, and clover, makes the common huſbandry more profitable here than in many other places, where ſtiff clay, or poachy ground, might make it inconvenient to adopt the turnep culture: in which caſe a fallow every fourth year, at leaſt, would be attended with nearly the ſame expence, without any crop to repay it: and this ſoil being too light for wheat, I ſhould think, a horſe-hoed crop of it would ſucceed better in a rich loam, or even a ſtrong clay.

ARTICLE

ARTICLE VII.

Three Accounts of the Cultivation of Burnet, and its Utility in feeding Sheep and Horſes: the firſt by Mr. JARVIS, *who ſowed it with Barley, and alone; — the ſecond by Mr.* SISSON; — *and the third by* ROBERT BARBER, *Eſq. who has added ſome Obſervations on the Turnep-Cabbage, and Anjou Cabbage: the whole communicated to the* Society for the Encouragement of Arts, Manufactures, and Commerce; *and inſerted at their Requeſt.*

To *Robert Doſſie*, Eſq.

SIR,

I Am directed by the Society for the Encouragement of Arts, Manufactures, and Commerce, to deliver to you Mr. JARVIS's and Mr. SISSON's Accounts of Burnet; and Mr. BARBER's Letter on Burnet, and different ſorts of Cabbage; in order to their being publiſhed in the Memoirs of Agriculture, if you think proper.

By Order,

Strand,
March 7th, 1769.

PETER TEMPLEMAN.

To Dr. *Templeman.*

SIR,

HEARING an extraordinary account of burnet, early in the ſpring, 1766, I bought ſeven pounds of it: one pound of which, I ſowed in ſeveral kinds of ſoil. In all of them it grew very well.—The remaining part of it, I ſowed upon a rod of land at Midſummer following. The land had been ploughed three times; and made very clean. The other part of the cloſe was ſown with turneps. The turneps and burnet were kept very clean and free from weeds. There was a good crop of both. In November, I put in nine of my worſt lambs, in order to keep the cloſe clean. They eat the burnet before any thing *. I permitted them to do it:

* Notwithſtanding the readineſs with which, Mr. Jarvis thus found his ſheep and lambs eat the burnet; and of which there are many other inſtances; yet there are particular places, where, from ſome hitherto undiſcovered quality of the ſoil, it is rendered ſo diſagreeable to ſheep, as well as neat cattle, and horſes, that either all abſolutely refuſe it, or only ſome few can be reconciled to its flavour, particularly while, it is ſtrong and luxuriant. It is, therefore, proper to intimate, that ſome experiment ſhould be made on this point, before the engaging in the cultivation of burnet, on any conſiderable quantity of land. The ſame caution has been before given, in the firſt volume of this work: but it cannot be too often inculcated, where the facts preſented might induce thoſe, who are not apprized of this limitation of them, to incur the danger or loſs, which may be prevented by a previous trial. R. D.

and

and they throve much better than the lambs on the turneps. In my opinion, an acre of burnet will yield more fodder than an acre of turneps; and will keep ſtock longer, and better. About Chriſtmas, a very deep ſnow fell; and continued upon the ground for three weeks or more. When the ſnow was gone, the burnet looked very hearty; and was fit to turn cattle in again. But, being deſirous of ſowing ſome more, I let it reſt till a week before Midſummer: and then I mowed it. It produced a great quantity of ſeed; but the weather was ſo very bad, that it lay thirty days. I was obliged to turn it often; which occaſioned a loſs of more than half the ſeed. But I found it weighed ninety-four pounds. The herb of it was ſo decayed and rotten, that no cattle would touch it: the ſwarth being ſo long upon the ground; and the weather proving ſo wet. The graſs lying ſo long, prevented my having a ſecond crop of ſeed. I have put ſheep into it a ſecond time: and they eat it greedily, as before; and thrive much: ſo that I ſhall lay it for ſeed next ſummer. Being much pleaſed with my laſt year's burnet, in the ſpring, 1767, I prepared another parcel of burnet-ſeed, in order to try experiments. In March, I ſowed a rod of land, next to the firſt, where the turneps had been eaten off, and the land broken up for barley, with burnet alone. The reſt of my ſeed, I ſowed with barley. The rod of land,

I ſowed

I ſowed with burnet alone, was ſo full of weeds, it was a great expence to me, to keep it clean. That ſown with barley, had a full crop of barley: and, in my opinion, promiſes to be as good as what was ſown alone. The expence of weeding, and loſs of crop, make a great difference. So the beſt way of ſowing burnet is with a crop of barley, or oats, in March. Burnet is an exceeding fine paſture for ſheep. I have obſerved the ſeed to lye upon the ground untouched by the birds: and, when rain comes, it will grow, though not covered before the rain. After the firſt year, it requires no weeding; but muſt be weeded ſeveral times at firſt. My

* As it appears by theſe trials, that burnet may be ſown with barley and oats, without any injury to the crops of them; or ſuffering by them, as to its own produce; but, on the contrary, is kept, by this means, much more free from weeds; it opens a very profitable method of procuring a quantity of excellent winter-food for ſheep, or occaſionally for neat cattle, without any additional expence, but the price of the ſeed: which, to thoſe, who raiſe it themſelves, is almoſt nothing. If burnet be thus ſown, along with barley, on lands intended the next year for lea, or turnep-fallow, it may, after being eaten in the winter, and ſpring, by ſheep, or lambs, be plowed in at the time it ceaſes to be wanted; and being effectually buried by a good drench-plow, will, together with the dung of the ſheep, be of great benefit; and ſpare a conſiderable part of the manure, that might otherwiſe be requiſite.—There are other applications, which this practice admits of, that may afford great advantage, in particular caſes, as well as where the burnet is deſigned to be continued to grow as a paſture-graſs. R. D.

cattle

cattle eat it at all times of the year, whenever I tried them. As to the value of the land, before it was plowed, I rented it ſeveral years at five ſhillings per acre. The quantity ſown upon a rod was ſix pounds. Theſe are ſuch obſervations as I have been able to make upon burnet. If you think, they may be any ways uſeful to the public, they are entirely at your diſpoſal.

I am &c.

December 17, 1769,
Little Caſterton, Rutland, near Hamford, Lincolnſhire.

JOHN JARVIS.

GEORGE SISSON of Bridge-Caſterton, in the county of Rutland, farmer, did, in May, 1767, ſow, upon one acre of creech-land, in Ingthorpe lordſhip, in the ſame county, properly cultivated as for turneps, fourteen pounds of burnet, in an incloſure, which was ſown with turneps cultivated in the ſame manner. After the turneps were ſown, the burnet was laid; and not meddled with till the time the turneps were ſtocked for eating off: which was in March 1768. The burnet grew to about eighteen or twenty, and ſome about twenty-two inches in length: having received no damage by the inclemency of the weather: although, the turneps rotted greatly. And, I verily believe, it did as much ſervice to the ſheep, as the beſt acre of turneps in the ground. The ſheep

being remarkably fonder of the burnet than the turneps, I was under a neceſſity of eating the burnet till all the turneps were eaten off; and the turnep-land ſown with barley; which was the firſt week in April, old ſtyle. The burnet grew; and was a tolerable good crop, to all appearance; but, being a ſtranger to it, I believe it ſtood two or three days longer than it ought. It began to ſhed very much, as I mowed it; which was in the beginning of July: but, the weather being favourable after it was mowed, prevented its ſhedding much from that time. When it was properly in order, as hay, or ſaintfoin, I carried it into a barn; and threſhed it out: and, to my aſtoniſhment, when winnowed, there were twenty-three buſhels*; or two quarters and

* Twenty-three buſhels of ſeed from an acre of burnet, though it ſeemed an aſtoniſhing produce to Mr. Siſſon, is yet but a ſmall crop. It appears from the account given by Mr. Lamb, to the Society for the Encouragement of Arts, Manufactures, and Commerce, and quoted in a note, page 207, of the firſt volume of this work, that an acre of burnet will afford ten quarters of ſeed from two crops taken together, which may be had in one ſeaſon. He found his horſes eat this ſeed very readily; and imagined it as good for them as oats: but it were much to be wiſhed, that more concluſive experiments were made of its effects in feeding horſes, neat cattle, and hogs. For full crops of it might be obtained after the herbage had been eaten off by ſheep, or neat cattle, at any time from the middle of October to the middle of March. The double advantage of its anſwering both the purpoſes of graſs, and corn, would render it very valuable. R. D.

ſeven buſhels, that weighed five hundred ſixty-two pounds and a half, neat ſeed from fourteen pounds only; which was ſown. The fodder, the horſes eat much like the ſaint-foin, after it was threſhed.

N. B. The fourteen pounds I ſowed the acre with, coſt me ſeven pence halfpenny per pound; which amounts to eight ſhillings and nine-pence: and the five hundred and ſixty-two pounds and half, after the ſame proportion, amount to ſixteen pounds eleven ſhillings and ſix pence halfpenny. This being my firſt experiment of the burnet-graſs, the good ſucceſs I had, will induce me to make a further experiment. I intend (God willing) to ſow twelve acres of land in the ſame lordſhip, (properly cultivated) in March 1769, with a crop of barley, in order to find out the beſt and moſt advantageous method of dealing with the ſaid ſeed; and ſhall endeavour to introduce it in another lordſhip in the ſame county: and others of my family intend doing the like upon different ſoils.

Bridge-Caſterton, Aug. 1ſt, 1768. Witneſs my hand,

GEORGE SISSON.

N. B. Mr. John Jarvis of Little-Caſterton, in the ſame county has tried the ſame experiment, with the like ſucceſs.

SIR,

SIR,

INCLOSED you receive an account of burnet ſown by me in the year 1766. The yearly value of the land, on which it is cultivated, is not mentioned in it: as it hath not been rented for ſome years: nor is the ſpecifying that particular, I think, required in the advertiſement for burnet ſown that year. In my own opinion, however, ſeveral acres of this land were not then worth three ſhillings per acre, per annum: and the whole number of acres, one with another, not more than ſix ſhillings per acre, per annum; but they are now really worth twenty ſhillings per acre, per annum, at the leaſt computation; and the land improves in value every year, by ſheep feeding on it, and the falling out of the burnet-ſeed. I obſerve, by the feeding of it with ſheep, the ground fills naturally, with the native trefoils: which makes a very ſweet and improving paſturage, that the ſheep feed much on, before they eat the burnet. When the burnet is in its luxuriant ſap and growth, in the heat of the ſummer, ſheep are not then fond of it: but they will feed on it well later in the ſummer, when the ſap is declined, and the herb not ſo ſtrong, in ſmell or taſte. I muſt further obſerve, that ſheep brought from ſweet trefoil-paſture, do not reliſh the burnet until they have eaten the ſweet graſs, that may grow amongſt it. But my ewes,

that have fed on it for two years paſt, will feed on it at any time in the ſummer: and ſheep, bred on it, naturally feed on it better than others; and, by nibbling it with the other natural graſs, ſoon reliſh it. Sheep prove well, that feed on burnet. It is a healthy ſound graſs; always in ſap; and greatly beneficial to a ſtock of ſheep in the ſpring-time, when there is no other graſs.

I believe burnet will prevent the rot in ſheep: of which I ſhall next year ſend an experimental proof; as alſo a full, ample, and experimental account, of burnet ſown in with wheat, barley, ſummer-vetch, buck-wheat, trefoil, and cow-graſs: and on the graſs ſward. As alſo, of the different ſoils, culture, and ſeaſon of the year, when it was ſeverally and reſpectively ſown. I ſowed in the year 1767, with burnet, about forty-five acres: and, in this preſent year, 1768, I ſowed about ſixty acres. From the obſervations, and experiments, I have made on ſowing burnet, I yearly improve in it: as I am thereby better acquainted with the ſoil; culture; the ſeveral times of the year for ſoing it; what grain it may be ſown with; the times of the year for mowing, ſeeding, feeding, and laying it up; and all other requiſites to give burnet its real utility and value. Of theſe I ſhall be always ready to inform the Honourable Society, before the account, I ſhall ſend, for the year 1769.

I did

I did not ſow any turnep-cabbage, this year: though I had ſome buſhels of ſeed, of the produce of the year 1767, of which I omitted ſending an account to the Society. But I have ſeveral plants of it in my garden, from ſeed which fell out: one of which, of the round ſort, is very large. I find they vary much in their form. I have of the oblong ſort; and ſeveral of a ſtem of a foot and a half long; ſwelling or forming bulbs near the head of the ſtem. This laſt ſort is of the red ſpecies; and more apt to * ſuffer by the ſeverity of the winter, than the low-rooted ſorts. I have collected ſeed of four ſorts of them, and am trying, by planting together the ſeveral ſorts of them, intermixed with the Anjou, Jermin, or Jeruſalem, and others, to ſee what effect they will have by their reſpective farina on each other: of which effects I have already ſeen ſome variation, from experience.

* This deviation from the general figure of the turnep-cabbage, into a long ſtalk with an oblong enlargement, in the upper part, inſtead of the globular bulb-like enlargement near the bottom, ſeems to be the conſequence of a degeneracy of this plant, by a mixture with the common kinds of cabbage: the *farina* of which might eaſily have had acceſs to the plants, that produced this ſeed as they grew in a garden. The ſame ſuppoſition accounts for their being tenderer than ſuch plants of the turnep-cabbage, as preſerve their original manner of growth: as the common cabbage is leſs hardy than this kind. R. D.

I find the Anjou cabbage to be preferable to any other; both for the garden and field uſe: as it is a very quick-growing plant; ſtands the ſevereſt winter; produces a ſucceſſion of a great many ſprouts in the ſpring; eats very finely; and, after repeated gatherings, produces a great quantity of ſeed. This I experienced laſt year: and had ſome plants above eight feet high. They were large in their ſtalks: and were ſupported with large ſtakes. There are three ſorts of it. I muſt, alſo, obſerve, that the turnep-cabbage, both root and green, when young, is moſt delicate, for its ſacchrine juice and flavour: which I now experience to my great ſatisfaction.

I am, &c.

Nov. 23, 1768.

ROBERT BARBER.

To the Honourable Society for the Encouragement of Arts, Manufactures, and Commerce, at the Society's Office, oppoſite Beaufort Buildings, in the Strand, London.

BURNET ſeed ſown on the eſtates of Robert Barber, Eſq; called by the names of Southway Bond-houſe, and Pound, ſituate in the Pariſh of Whetſtone, in the county of Devon, about four miles from the city of Exeter.

Upper Down was ſown in June 1766:—Goldimore was ſown in Auguſt 1766:—the

ſoil

ſoil of the above two fields is moſtly of a gravelly, poor, looſe nature; not deep in the ſurface: ſome part of it of a cold clayey bottom; but moſtly of what they call here, a ſhillack; or looſe ſtony and ſlaty bottom.

Upper Down had lain ſeveral years on the Green-ſide: but was ſo poor, that ſome acres of it had but little ſward on them; and that was briery, and of a poor hairy graſs.

Some part of it, which was ſo poor, was plowed but once with a ſwing-plough; and dragged and harrowed ſeveral times long-ways, as it was plowed, till there was earth enough raiſed, by that means, for ſowing the ſeed: which was firſt ſown with Buck-wheat, about two buſhels in an acre, to ſhade the burnet; and harrowed in long-ways ſeveral times; afterwards rolled, and ſown in with burnet-ſeed, about eight pounds to an acre: which was then well harrowed in long-ways, and rolled.

The other part of Upper Down was plowed, dragged, and harrowed, in the ſame manner; then ſown with ſummer vetches, or tares, harrowed, and rolled; and afterwards ſown with burnet ſeed, about ſixteen pounds to an acre, well harrowed in, and rolled.

The Burnet ſown with the buck-wheat in the Upper Down grew very well; looked very green; and, after the buck-wheat was mow-

ed, ſpread, and ſtood the winter very well: but it was ſown too thin. On the other part of Upper Down, which was ſown with the ſummer-vetches, the burnet throve very well; and, after the ſummer-vetch was mowed, which in ſome part of the field got to be too ſtrong and over-ſhadowed it, grew, and flouriſhed very well. It was fed the next ſpring with ſheep, till the latter end of May; when it was laid up: and it was mowed for ſeed, the latter end of June. It produced twenty-four buſhels per acre of ſeed ſaved: and as the ſeaſon was bad, for ſaving it, 'tis believed more ſeed fell out, than the quantity actually ſaved. It was fed ſome time afterwards, before it was laid up for a ſpring-feed.

Upper Down, after being laid up for a ſpring-feed, was not fed till Candlemas-day: when there was a good head of graſs in it. It was ſtocked with ninety couples of ewes, and lambs: which fed on it with a true reliſh: and it was of great ſervice to them. As there was then no other graſs for them but burnet; and they fed ſtrongly on it, ſo late as to the middle of May laſt. It was then laid up; though it was but ſhort; and bore a middling quantity of ſeed: part of which fell out, on the account of the wetneſs of the ſeaſon. The remainder of it was mowed; and the ſeed ſaved: the quantity of which we cannot aſ-

certain,

certain. As the caſualty of the ſeaſon obliged us to put it with other burnet-ſeed; which grew in different fields, from either of the two above-mentioned.

Upper Down had a good head of after-graſs; hath been fed with ſheep; and is now laid up with a good head of burnet; promiſing well for the ſpring-feed.

Goldimore was partly ſpaded, and burnt, though imperfectly, from the wetneſs of the ſeaſon. It was plowed, dragged, harrowed, rolled, and then ſown with burnet, about eighteen pounds to the acre, harrowed in well, and rolled.

The burnet ſown in Goldimore was fed in the ſpring; and laid up for mowing: but, the ſeaſon being wet, there was not much of the ſeed ſaved. It fell out: but otherwiſe, the herb was well-ſeeded.

Goldimore had a good, and ſtrong feed of burnet-graſs in it; and was much thicker, by the ſeed's falling out. It was of great ſervice; and fed during the laſt winter, and ſpring, by a ſtock of old ewes; which fed it cloſe to the ground, when the ſnow covered it. It was hard-fed till the middle of May laſt; and then laid up. It grew very faſt; flouriſhing; and bore a good quantity of ſeed: but the weather proving very wet and unſeaſonable at the proper time, when it ſhould have been gathered in, and ſecured, the great-

eſt

eſt part of it fell out. Some of it was mowed, and made into a rick, with what ſeed was left in it: which is not yet threſhed out. The ſheep feed on it very well; eat it very bare; and proved very well: and it was of great ſervice to them, as there was no other graſs but burnet, at that time, to feed on. It is now laid up with a good head of burnet-graſs, for the ſpring-feeding.

We being three of the principal inhabitants of the pariſh of Whetſtone, Devon, do certify, that the above account of the quantity of land; the quality of ſoil; the culture; the burnet-ſeed ſown, and the produce of it; the feeding off the burnet with ſheep; and its effects on the ſheep; are true, according to the beſt of our belief and judgment; as witneſs our hands this 22d of November, 1768.

JOHN WILLS,
WILLIAM HORWELL,
WILLIAM HOLMAN.

ARTICLE

ARTICLE VIII.

Obſervations on COLE-SEED; *in which its Difference from Rape; and its Utility, with the various Methods of its Culture, as a Winter and Spring-food for Neat Cattle, and Sheep; are explained:*

THE Society for the Encouragement of Arts, Manufactures, and Commerce, laſt year made the culture of coleſeed, with a view to feeding neat-cattle and ſheep in the winter and ſpring, an object of their premiums: and they have done the ſame this year in more than one light: Indeed, the greatly experienced advantage of this plant, for that purpoſe, had before eſtabliſhed the cultivation of it in ſeveral counties of England: where its hardineſs, copious product, and peculiar efficacy in fattening ſheep are now extending its uſe. Theſe circumſtances have, at preſent, excited the public attention to the culture of this herb; which, notwithſtanding its introduction into particular parts of the country, was till very lately ſcarcely known by name in moſt others; and occaſioned many of thoſe, who purſue improvements in agriculture, to make enquiries into its nature, and uſes.

In order, therefore, to promote the views of the Society in their premiums for the improvement

ment of the culture of cole-ſeed, and the introducing it into more general practice; and to give ſome aſſiſtance to thoſe, who are deſirous of making experiments on this plant, to determine the beſt methods of management of it, and its utility compared with other ſimilar kinds, for the purpoſes of feeding cattle, and ſheep; I thought it might be expedient to furniſh ſome account of its difference from rape, with which it is in general confounded; and of the moſt approved methods already practiſed in its cultivation for the uſes here mentioned.

This is the more neceſſary, becauſe the confounding the cole-ſeed, with the rape; which is cultivated for its oil only; and is not equally well adapted to the purpoſes of feeding cattle; has prevailed ſo much, that numbers, who have enquired for the ſeed of the firſt, have been miſled, even by ſeeds-men, as well as others, to believe, that they are the ſame plant under different names: and conſequently, that the Society have been led, through ignorance, or ſome blunder, into a miſtake with reſpect to this point; which is, nevertheleſs, by no means the caſe. It is not, however, to be wondered at, that the London ſeeds-men, who ſeldom examine nicely into matters which do not concern ſtaple articles of their trade; and who, dealing only in the retail ſhop-way, have little buſineſs with thoſe ſeeds that are ſown only in particular places of the country, where they

they may, conſequently, be more conveniently had than through their hands; ſhould fall into this error: nor that others who gain their information from reading ſhould be led into the ſame deception; as ſeveral circumſtances have contributed to give foundation to it. The notion, that cole-ſeed, and rape, were the ſame plants, was eaſily adopted from their affinity of ſpecies, and the application of the ſeed of both, to the ſame purpoſe of making oil: as the cultivation of cole-ſeed for the feeding cattle, ſpreading itſelf into a great number of places, where that of rape, which is raiſed for the oil only, was never known, it might be eaſily imagined, they were the ſame. The confuſion of writers, which has long obtained with reſpect to the true diſtinction of theſe plants; and which Tournefort complains of; and the adoption of the miſtake of their being the ſame plant by moſt of the lateſt writers, who have treated of them, as an article of huſbandry; have confirmed this error. Mr. Paulet, who had the conduct of the Muſeum Ruſticum till the laſt eight months of its duration, ſaid, in a note, "That cole-ſeed, and rape, were the "ſame:" and the accounts of the cole-ſeed, given by correſpondents in that work, agree with him in this aſſertion. Miller, in his Gardener's Dictionary, has alſo confounded the rape and cole-ſeed: as being names of the ſame plant. It is not to be wondered at, therefore,

, therefore, that others, who do not live in places where both theſe plants are cultivated for their oil, or who are not particularly concerned in the ſale or preparation of rape-oil, under which name both kinds generally paſs; ſhould be led to believe, rape and cole-ſeed are the ſame plants.

Mr. Varley, however, who has written upon huſbandry has mentioned very juſtly, that rape and cole-ſeed are different plants; and has touched, in a general way, on the true diſtinction betwixt them. I endeavoured, myſelf, alſo, to ſet the matter in a clear light, in ſome notes on two letters from Mr. Wynne Baker, and another gentleman in Ireland, inſerted in the Muſeum Ruſticum, vol. V. page 296, &c. ſeq. But this can only have rectified this notion with thoſe, who have read theſe works.

It may conſequently be a matter of utility at preſent, to point out the real difference betwixt the cole-ſeed, and rape; as well as to furniſh to the public a diſtinct account of the beſt methods hitherto practiſed in the cultivation and uſe of cole-ſeed, for the purpoſe of feeding cattle and ſheep.

The kind of plant, which was firſt ſown in our country, as early as the time of queen Elizabeth, for obtaining the oil known then, and to the preſent, under the name of rape-oil, is a ſpecies of wild turnep, diſtinguiſhed, by the earlier writers, by the names of *Bu-*

nias; *Bunias ſylveſtris*; *Napus ſylveſtris*; *Napus flore luteo*; and in Engliſh, *Navew gentle*, or *Wild navew*. The former writers on botany divided the turnep kind into two tribes: the *napus* and the *rapa*: but this ſpecies properly belongs to the firſt; and is ſo ranked by moſt authors: though, from the inaccuracy and confuſion of names, in the earlier times, the oil was called rape-oil. And the plant itſelf has been ſince called ſo, by the common cultivators of it for that uſe.

This ſpecies, like the others of the *braſſica* genus, which, in modern botany, includes both the cabbages and turneps, is apt to vary; or ſport as the gardeners call it, with reſpect to the figure of the leaves; eſpecially if any of the cabbage tribe grow near, or with it. Theſe leaves are ſometimes like thoſe of the garden-turnep, and even more cut and jagged; and ſometimes more entire; varying to thoſe of the coleworts. Whence ariſes a difficulty of deſcribing this plant, ſpecifically; and that variation, in the authors who have attempted it. In other reſpects, this kind, reſembles the common turnep: except that the root, which is much of the figure of a top, is not near ſo large. This ſpecies is tenderer than ſome others, both of the turnep and cabbage kind; and is ſometimes deſtroyed in very ſevere winters: but it will bear the rigour of common ſeaſons without ſuffering.

The

The *cole-ſeed* has more affinity than the rape, with the cabbage kind; and is juſtly deemed of that tribe: being, in fact, a wild colewort. It is called by the older writers, *Braſſica arvenſis*;—*Braſſica rubra minor*;—*Braſſica ſylveſtris*;—*Crambe*;—*Colſa*: and in Engliſh *Field-colewort*. This plant reſembles the other kinds of coleworts; but it is ſometimes leſs; and frequently degenerates towards the turnep, in the appearance of its leaves. It may, however, be eaſily diſtinguiſhed from the rape, or wild navew, by the leaves being leſs cut and jagged, and of a darker, and purpliſh colour; and by the root's not verging to a bulbous form; as is found in that, and all the turnep-tribe. It appears, by Lemery, to have been much cultivated in Flanders, in his time, for the ſake of the oil obtained from the ſeed, under the name of *Colſa*. He ſays, "That the ſeed commonly "called *Navette* is not *Navew* ſeed, as many "imagine; but the ſeed of a kind of cole-"wort: which in Flanders is called *Colſa*; "and cultivated as well there, as in Nor-"mandy, Brie, and Holland." Gerard mentions, alſo, "that the *Bunias* or navew "gentle, and the *crambe* or field colewort "were both cultivated in foreign parts for "their oil, in his time: and that he had "heard, the navew gentle was cultivated for "the ſame purpoſe in England." It was much later, that the cole-ſeed was brought into

into uſe in England. It being only within the memory of perſons now living, that this plant was procured from Flanders; and cultivated by thoſe who were largely concerned in producing rape-ſeed for the making oil.—They imitated the practice followed in Flanders, of raiſing every year a proportion of it, as well as of the rape, on account of its ſuperior hardineſs: which ſecured them a crop of ſeed, when, from the extraordinary rigour of the winters, the rape might fail. The name *Colſa* was brought hither with this plant from Flanders; and has been corrupted into that of cole-ſeed, by the ruſtic cultivators. It is not only hardier than the common rape; but produces a much greater burthen of herbage: and, on thoſe two accounts, it has for ſome years been cultivated for feeding cattle, where there is no intention of reaping the ſeed. But it is ſtill raiſed in other places for the ſeed only; and in ſome for both intentions together: as we ſhall ſee below.

The marquis de Turbilli, in his account of the culture of cole-ſeed, in Flanders, ſays, There are three kinds: The *white*; the *warm*; and the *cold*. He obſerves, that, "The *white* cole-ſeed is ſo called, from its "having a white flower; and was intro-"duced into Flanders from Holland, three or "four years ago. They ſay, it reſiſts the "froſt better than the next kind; yields ſome-"what more ſeed; and is generally ripe about

" ten or fifteen days later.—The *warm* cole-
" ſeed is moſt common in Flanders; and eſ-
" teemed the beſt: becauſe it thrives in ev-
" ry ſoil; and requires leſs manure.—The
" *cold* cole-ſeed ſeems to have been brought
" from Holland, as well as the white. It
" is, without doubt, the hardieſt: reſiſting
" the froſts beſt. It grows to a greater height
" and ſize than the other: ſometimes at-
" taining nine or ten feet. Its ſeed is,
" alſo larger: but the difference is ſcarcely
" perceivable in this point. It is more ſub-
" ject to be damaged by inſects than the
" others; and does not, like them, ſend
" forth branches from the bottom of the
" ſtalk. It, alſo, requires great plenty of
" manure. The two laſt-mentioned ſorts
" have a yellow flower." The reaſon of the name of the white cole-ſeed, as given by the Marquis de Turbilli, is very obvious. But it does not appear, why the others are called the *warm*, and the *cold*. It is the laſt, or cold cole-ſeed, we cultivate here: the others not having been brought into England: or, at moſt, only as curioſities. The warm cole-ſeed, however, as it thrives on poorer and drier ſoils, and requires leſs manure, would, undoubtedly be uſeful in ſome caſes.

There are two methods now in practice, for the cultivation of cole-ſeed; whether for the feeding cattle and ſheep only; or for that purpoſe, and reaping the ſeed alſo. Theſe

methods are, the ſowing the ſeed at large in the field, and hoeing it, as is done in the caſe of turneps; or the raiſing ſeedling plants in beds; and tranſplanting them into the field. The particulars of both theſe methods will be given below: but it is proper firſt to touch on thoſe circumſtances, which are general, and common to each method.

The kind of cole-ſeed, we cultivate, requires the beſt land, not only as to richneſs but texture of the ſoil. For a perfect pulverization, or tilth, is neceſſary, as well as fertility of the land, to the obtaining great crops. It is in vain to expect them of this plant, either for ſeed, or paſturage, on a poor, dry, and cold ſoil. It thrives well on land ſubject naturally to be moiſt: provided it be rendered free from much wet, by draining, and a proper method of plowing: that is, by forming high ridges and deep furrows, venting themſelves duly into drains. As the greateſt richneſs of ſoil is thus neceſſary in the general method of culture of this plant, plenty of manure is in moſt caſes requiſite; or, at leaſt expedient: eſpecially where crops of the ſeed are deſired. It may, however, ſometimes be cultivated to advantage, with a moderate quantity of manure, on lands that would otherwiſe be deſtined to lea, or turnep-fallow, where a crop of ſpring-corn is to ſucceed it. In this caſe, being fed off early in the ſpring, the remaining ſtalk and

herbage may be plowed in, by a good drench-plough; and very good crops of barley are to be obtained by this means. The Marquis de Turbilli ſays, "He has ſeen cole-ſeed "yield good crops on dry chalk ſoils, on "which ſtreet-dirt had been laid." But this, according to other parts of his account, muſt be only underſtood of the warm kind; and not of that which we have.

As a good tilth is peculiarly requiſite for great crops of cole-ſeed, where the land is newly broken up, and is of a ſtiff texture, four plowings are beſtowed: but, in looſe ſoils, three are ſufficient. In ſtony land, it is proper, alſo, previouſly to the ſowing, to break the land by harrowing or rolling, as occaſion may indicate to be neceſſary. The ground in the plowing, ſhould be laid in what is called four-bout lands; and where it is apt to be wet in winter, the ridges ſhould be high; and the furrows deep, venting themſelves into proper drains, that the plants may not lie under water in caſe of great rains.

The ſowing in the field at large, in the broad-caſt way, is the moſt general method practiſed in England, for the cultivating cole-ſeed for the feeding cattle and ſheep. — In this caſe, if the land be ready, the ſeed ſhould be ſown in July. This may be always done where there is not a preceding crop of grain, or pulſe, the ſame year. But as this plant may be cultivated with advantage, in many

caſes

caſes where crops of grain or pulſe have been ſcraped, it may be ſown a month later: which will give time for the two plowings; and the laying on ſuch a manure as may be neceſſary.

Various manures have been recommended, as moſt ſuitable to cole-ſeed, in different places. But it does not appear, that the particular advantage of any manure ariſes from its peculiar relation to this plant; but to its being beſt adapted to the melioration of the particular land on which it happens to be cultivated. It is the fitneſs in this view, and the due quantity, on which the good effect of the manures depends. Pigeons dung, wood-aſhes, ſweet dirt, and other kinds, have, however, their full efficacy, as ſtrong manures, in the culture of this plant: and the beneficial choice of the reſt muſt be decided on the experience previouſly had; or on a juſt ſpeculative judgment of the nature of the ſoil.

In the preparation of the land to receive the ſeed of this plant, it is harrowed by ſome; and, by others, turned up in narrow ſpits, and ſhallow furrows. If the laſt method be purſued, a four or five-coultered plow, conſtructed properly for making ſeed-furrows with ſmall intervals, may be uſed. There is a model of ſuch a plow formed on very good principles in the collection of the Society for the Encouragement of Arts, &c.

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The quantity of ſeed for an acre, when ſown in broad-caſt, has, by general experience, been found to be half a peck. This is ſown by the hand, as other ſeed. The ground prepared, in either of the above ways, ſhould be afterwards buſh-harrowed to cover the ſeed. Where, however, the ſeed is intended to be ſown on the furrowed lands, it would be beſt to uſe a proper drill-plow: which would not only ſave the trouble of hand-ſowing, and buſh-harrowing, by performing thoſe operations along with the making the furrows; but, alſo, ſpare half the ſeed, and cauſe the reſt to be more effectually covered.

When the ſeedling plants have riſen from the ſeed-leaf, it is practiſed, in ſome places, to hoe them as turneps: leaving ſix inches, or, according to ſome, a foot diſtance, betwixt each. Others never hoe them; but let the plants riſe together, and ſtruggle with each other. The latter method is practiſed, as we ſhall ſee below, in the fenny countries: and, alſo, in ſome parts of Flanders. The firſt is more general here, in other places except the fens. Perhaps both theſe methods are right in the parts where they are practiſed. In caſes, where the ground is very rich, and manure copiouſly uſed, the plants having a luxuriant growth, riſe high, and ſpread wide: in which caſe, the greateſt crop is gained by giving them room. When, on the contrary, the ground is poorer; or little manure

nure uſed, as in the fens, where the aſhes of the burnt ſwarth only are employed; the filling the ſurface of the ground with the plants is moſt conduſive to the increaſe of the burthen.

It ſometimes happens from accidents, and other cauſes not eaſily diſtinguiſhed, that the plants of the cole-ſeed fail wholly, or in a conſiderable degree, to riſe in parts of the ground on which they have been ſown. It is proper, in ſuch caſes, to tranſplant, into theſe vacancies, ſome of the plants, from places where they appear thickeſt. If this be done, in the evening, or on cloudy days, they will ſeldom fail of taking root, and doing well, if a ſlight watering be beſtowed on them, ſhould the weather prove very dry.

The cole-ſeed is apt to ſuffer from a variety of different inſects, or ſmall animals; which infeſt it in different places, and in different periods, of its growth. The moſt general in our country are *ſnails*, called *ſlugs*; the *black fly*; the *black canker*; and the *green caterpillar*. Cole-ſeed is alſo ſometimes ſubject to the *ſmut*, where it is raiſed in foggy places, and a great quantity of freſh dung has been laid on the land.

It has been found a very efficacious remedy for the miſchief reſulting from the *ſnails*, to ſow, over the young plants, a mixture of ſlaked lime, and wood-aſhes, in the proportion of about ten of the lime, to fifteen of the aſhes, for each acre. This not only an-

ſwers the purpoſe of deſtroying the ſnails, and other noxious animals; but promotes greatly, as a manure, the growth of the cole-ſeed.

The *black fly* is a very ſmall inſect: ſo little, indeed, that, being nearly of the colour of the land, it is ſcarcely perceiveable, but by its effects; and its motion, which is obſervable on the herbage, like the hopping of a flea. It attacks the leaves of the young plants immediately after their firſt ſprouting: in which caſe, after it has made great ravage, the only relief is to ſow the land over again. For when the firſt leaves are deſtroyed the plantling dies. In this caſe, the land ſhould be raiſed with a light wooden harrow, in order that the ſeed may ſtrike root the ſooner; and leſs time be loſt. A heavy harrow deſtroys the furrows.

The moſt effectual remedies againſt the black fly, when taken in time, have been pointed out in Mr. Reynolds' letter, on the turnep-rooted cabbage, inſerted in the firſt volume of theſe Memoirs, page 136.

The *black canker* attacks the cole-ſeed in a more advanced ſtage of its growth: that is, when about the ſize of a ſmall cabbage-plant.

This *canker*, as it is called, is a ſmall black worm, about a quarter of an inch long. Windy and rainy weather are the beſt natural cures for this evil. There is, however, an artificial means of mitigating it; which is this: Let two men take a cart-rope, each holding one end; and draw it twice or three

times over the plants. It will beat the canker-worms off the plants; and either kill, or at leaſt throw them on the ground, whence they ſeldom riſe again.

The *green caterpillar* is the laſt enemy, which attacks the cole-ſeed plants; and comes about the latter end of September. It is a green grub of about an inch long. This animal makes great havock while it exiſts: but the froſty mornings generally ſoon deſtroy it. The means of art, by which it may be reſiſted, is, to uſe the ſame expedient as for the black canker.

The *ſmut* in cole-ſeed, as well as in grain, is more eaſily prevented than remedied. It ſhould be avoided, to lay on too much freſh dung in damp places; or to mix a a proportion of quick lime with it: which will, in general hinder the ſmut from affecting the cole-ſeed.

With reſpect to the thinning the plants, by hoeing, it muſt be left to the judgment of the cultivator, as before intimated; who muſt be directed in it, by the fertility of the ſoil, and the luxuriance of the plants: and either omit it; or ſettle the due diſtances of the plants, where it is practiſed, on that principle. This is, however, to be underſtood, where feeding cattle or ſheep only, is the object of the culture. But in all caſes, where a crop of ſeed is deſired, the plants muſt be thinned to the diſtance of eight inches or a foot from each

each other: though this may be deferred, till they have been eaten down in the ſpring.

The manner, and time of feeding off cole-ſeed muſt be left, alſo, in a great degree, to the diſcretion of the farmer, according to his occaſions, and views. Particular caution is, however, neceſſary, in the caſe of neat cattle, that they ſhould not eat too much of it at firſt: and that ſome dry fodder ſhould be given to them, at times, with it. There is leſs danger with reſpect to ſheep: and ewes that have ſucking lambs, may be indulged with it, without the leaſt danger.

After the time of feeding off the cole-ſeed, it is ſometimes ſuffered, as above-mentioned, to ſtand for a crop of ſeed: in which caſe due regard ſhould be had, as above, to the thinning the plants; the deſtroying rank weeds; and, where practicable, looſening and ſtirring the ground: which laſt operation will greatly improve the crop. It is, therefore, much the beſt, where the land is rich, and there is any view of a crop of ſeed, after the feeding off, to ſow this plant in equidiſtant rows; and to thin them in the ſpring, by taking away ſo many of the rows, as will leave the plants at two feet, or ſomewhat leſs diſtance. In ſuch caſe, they may have two or three horſe-hoeings, as the plants make a progreſs: which will not only much increaſe the product of ſeed, but be of great benefit to the land itſelf.

Where

Where there is no crop of ſeed intended, the cole-ſeed plants, after feeding them off, ſhould be plowed into the land, by a proper drench plow. There is one of this kind, of an excellent conſtruction, invented by Mr. Ducket, in the poſſeſſion of the Society for the Encouragement of Arts, &c. The time of plowing in the cole-ſeed muſt depend on that of the feeding it off, and the future uſe that is to be made of the land. The plants ſhould be well buried when it is done: otherwiſe they are apt to ſprout again.

Theſe are the particulars of the moſt general way of cultivating cole-ſeed, for the feeding cattle and ſheep, when the plants are raiſed in the field where they are intended to grow; and where rich and highly-manured ground is in queſtion. But in the fenny countries, a different method is purſued: which is performed in the following manner.

When the cole-ſeed is cultivated on the fen-lands, care muſt be taken, that it be in places, which will not be flooded for any length of time in winter. Wherever there is any deſcent, open drains may now be eaſily, and at a very ſmall expence, made, by the drain-plow, procured by the premiums of the Society for the Encouragement of Arts: who have one kept in their poſſeſſion as a model. It is in general on ground freſh broken up for that purpoſe this plant is ſown in the fens: becauſe, beſides the benefit of the

the cole-ſeed crop, there is an advantage in the preparation of the land for other crops. Ground which has not been broken up for four or five years, though before in tillage, becomes again fit for this culture.

The treatment of the freſh land for the receiving the cole-ſeed, is by plowing and burning the ſward: which latter operation ſtands in the place of manure; as the aſhes are afterwards plowed into the ſoil.

The plowing, previous to the burning, is performed about the middle of May, and where practicable, it ſhould be from eaſt to weſt, that the plowing for the ſeed may be from north to ſouth: the plow uſually employed is of that kind, commonly called the Dutch plow. The ſhare of it is large, with thin edges and a ſharp point: which are kept in order by filing. The ſods raiſed by the plowing are to be about ſeven, or eight inches wide; and thin; that is to ſay, not above an inch and half in thickneſs. Baulks or miſſings ſhould be ſpared as much as is poſſible. When the turf has been raiſed, it ſhould be ſuffered to lye till it be dry; and then be collected into heaps. The magnitude of theſe heaps ſhould be that of middling graſs-cocks: and they ſhould be made of a tapering form, that the wet may run off. It is uſual to put one perſon to every ſeven furrows in the work of forming the heaps: by which means the whole will be regularly carried on. The

heaps

heaps ſhould not be placed equidiſtantly in the rows: but in the quincunx manner: that is, the heaps in one row are to be placed oppoſite to the middle of each interval of the other; as that admits of the aſhes being more eaſily and equally ſpread. It may be beſt underſtood by thoſe, who are not acquainted with the term quincunx, by this figure.

After the turf is dry, and the heaps formed, they ſhould be burnt as ſoon as poſſible, to avoid their being again ſoaked, if continued rain ſhould happen; and to prevent the ground from being covered with graſs, and herbs: which will ſoon ſprout in caſe of wet; and, in a great degree, defeat the end of the firſt plowing. As the ground will then, forming a new ſward, cohere again; and reſiſt being broken by the ſecond plowing: in conſequence of which the ſeed, when ſown, would be buried only in the depth of the furrows; and not be diffuſed elſewhere.

When the heaps are burnt, the aſhes muſt be ſpread as equally as poſſible over the land: and the ſecond plowing ſhould then be performed as quickly as poſſible: following the other operations as faſt as ſufficient parts of the land are prepared for it. This plowing ſhould be croſs-wiſe to the firſt. The diſtance of the furrows ſhould be the ſame as

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in the firſt plowing: and they ſhould be about two inches deep. For the ſoil being tough, rather than diſpoſed to break, there will be more ſeams by this management than if the diſtances were greater. The lands are formed of the width of about ten paces, that the furrows betwixt them may carry off the water, where there is a deſcent.

The ground being thus prepared, it is uſually ſown the night after plowing: which prevents the effects of its growing too dry.

The quantity of ſeed is, as before mentioned, half a peck: which is ſpread as equally as poſſible by the hand.

The ground is to be then buſh-harrowed, as ſoon as poſſible after the ſowing, to cover the ſeed. This is performed by a hurdle charged with branches of the haw-thorn.

The hoeing, or thinning, when the plants are come up, is omitted in the fen culture of the cole-ſeed: and, indeed, conſidering the rough ſtate in which the land is, according to the mode of tillage here deſcribed, it would ſcarcely be practicable. Moreover, the want of greater richneſs in the ſoil from the defect of manure, which is here only the aſhes of the turf, prevents, as above-mentioned, ſuch a luxuriant growth as would demand thinning.

The cole-ſeed, is therefore, ſuffered to remain without any operation till Michaelmas: at which time, it is uſual to begin to feed it off. This is moſt generally done by putting in ſheep,

ſheep, in order to complete the fattening them for the market; which purpoſe is much ſooner and more effectually anſwered by cole-ſeed, than by turneps, or almoſt any other kind of paſturage known. Indeed, it is obſerved, they will grow fatter in one month with cole-ſeed, than in two with turneps. The ſheep to be ſo fed are, for the moſt part, ſuch as are already half or three parts fat. If they be poor, a longer time is required. There is, however, no poſitive reaſon to conſume the cole-ſeed ſo early. Where there is a proſpect of wanting it later, the feeding off may be deferred to any part of the winter, according to the farmer's convenience.

The cole-ſeed, in this culture, is moſtly reſerved, after it has anſwered the end of paſturage, for a crop of ſeed the ſucceeding ſummer; and ſometimes not. This depends on the goodneſs of the ſoil, and other accidents, which may render the produce promiſing, or otherwiſe. But where the herbage appears ſtrong, it is generally found advantageous. When it is decided, to let the cole-ſeed ſtand for a crop of ſeed, the eating off ſhould be finiſhed before or about Candlemas: that the ſpring-ſhoots for the flower-ſtalks may not be injured. But, if no crop of ſeed be intended, the conſumption of the herbage, or the feeding off, may be deferred later in the ſpring, according to the occaſion, or proſpect of want, of the farmer.

It is a good practice, where a crop of ſeed is propoſed to mow the ſtumps of the plants grazed by the ſheep, or by the cattle, within three or four inches of the ground: otherwiſe being left jagged, and torn, they receive the moiſture when rain falls; and occaſion the plants to rot and die: or, if they eſcape, they dwindle, and are inferior in vigour to thoſe which are mowed.

The cole-ſeed is then ſuffered to riſe in this condition; and is left to itſelf to flower; and produce its ſeed. But, when the ſeed-pod is formed, it is frequently attacked by an enemy, that makes ſuch ravage, as ſometimes to render the crop ſcarcely worth reaping.

This is a ſmall *green fly*, which peſters the tender pods, and deſtroys them. As this animal poſſeſſes itſelf of the uppermoſt part of the plant, which is now high, it is too much raiſed above the ground, to admit of any of the means being effectually uſed to deſtroy it, which have been before mentioned to avail againſt the enemies of the young plants. The only practicable way to mitigate this miſchief is, by ſmoking the field: which, when performed with due advantages of wind, and a light atmoſphere, will ſometimes produce a conſiderable deſtruction, or expulſion of the flies.

The next attention is, to obſerve carefully when the cole-ſeed is of due ripeneſs to be reaped. It is very material to watch the proper

proper maturity: which is before the pods dry, and turn brown. For, if it be ſuffered to go on to full ripeneſs, this ſeed is ſo apt to ſhed on the leaſt motion, that a great loſs of it will, of courſe, happen in the reaping. It is proper, for this reaſon, to begin to cut the cole-ſeed, as ſoon as any of the pods appear browniſh: which is the beſt criterion, or mark, for diſtinguiſhing the time. This muſt be done, even though moſt of the pods appear backward in ripeneſs: for the ſucculence of the ſtalk will feed the ſeed during the drying; and bring it to nearly as good a ſtate, as that, which ſeemed moſt forward at the time of cutting.

The cole-ſeed being, according to theſe appearances, in a proper ſtate for being reaped, this work muſt be performed as quickly as poſſible. The method of reaping is the ſame with that for corn, except the following particular. The reaps are to be laid on the ground in a different manner from thoſe of other crops. The ſeeded heads of the plant are not to be all turned the ſame way: nor lye, conſequently, in each row at the oppoſite end of the ſtalk of the other. But thoſe of every two rows are to lye together; that is, two reapers are to work oppoſite to each other; and each is to turn the head of what he reaps towards the other; ſo that the heads of the reaps will be towards each other: but

they ſhould not, nevertheleſs, be brought ſo near as to touch.

When the reaping is thus performed, the cole-ſeed muſt lye on the ground, in this condition, till it be of proper dryneſs for threſhing. It will not bear turning, like other plants; becauſe the pods of the upper part, being dry, would open; and ſhed the ſeed, ſo as to make a very great loſs.—The time of drying cannot be reduced to any particular period: as it depends on the accidents of the weather. It muſt, therefore, be left to diſcretion. The means of judging rightly of it, is by the appearance of the reaped plant. When the ſtalk, or ſtraw, ſeems dead, and is become white; and the ſeeds, on opening the pod, or as it is called the *coſh*, are black and plump, ſeparating eaſily, or being nearly looſe from the coſh; it may be concluded, the cole-ſeed is in a fit ſtate for threſhing. If, however, the under-part appear greeniſh, when the upper-part is fully fit for threſhing, the whole muſt be gently raiſed from the ground; and made to reſt, or bear on the ſtubs, ſo that the air may paſs under it. This raiſing is generally performed the morning of the day on which the cole-ſeed is to be threſhed: as it will be ſufficiently dry before, what is called the bolſter, is completely made; and the people employed have breakfaſted.

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The threſhing is done in the field upon a cloth; which is about twenty yards long, and eighteen yards wide. The cloth and the operation, are called a *cole-ſeed ſale*: and it is ſomewhat difficult to give a *clear* notion of the different offices of the perſons employed, and the manner in which they go through them.

The number of people engaged in this work are about twenty. Of theſe, about ſeven are *gatherers*, who are women, and great boys or girls. This is the number where there is a midling crop: but where it is thin, more are required, to ſupply the threſhers with conſtant work; and, where thick, leſs. Theſe people bring the reaps together with a ſickle: for if they did not employ that inſtrument, they would ſqueeze them together too much; and, conſequently, force a material part of the ſeed out of the pods or coſh. They then put what they have collected into a ſheet, called the *bearing ſheet*; of which there are two uſed in every ſale. This ſheet is about ſeven feet wide; and has hoops on each ſide, through which a light pole is put. When it is filled with the reaps, it is borne by two ſtrong men, called, on this occaſion, *bearers*, to the threſhing-cloth; and there depoſited.

Inſtead of performing this work by hand, ſome have no bearers; but employ a carriage, which is called a *cole-ſeed cart*, to convey the

reaps to the threſhing-ſheet. This cart is made as wide and long as is practicable; has a ſheet laid in it; and is drawn by one horſe. The cole-ſeed is put into it with the greateſt care and gentleneſs, till as much be laid in it as it will bear. This is the general practice in ſome parts of Flanders, and followed by a few here. But the employing bearers is far preferable: as the other method requires almoſt as much help to load and unload, beſides the uſe of a horſe, and a boy to drive it: and the reaps cannot be put in and taken out of the cart without ſhaking out a material part of the ſeed.

When the reaps are thus laid on the cloth, a man, called the *layer on*, places them, in a row, acroſs it. They are then threſhed by four *threſhers*: who ſtand two on each ſide one row or floor of the reaps. While the *threſhers* are performing their office on the firſt row, the *layer on* prepares another row at a proper diſtance from it: and a woman, with a rake, follows the threſhers; and turns the reaps. The threſhers then proceed to the ſecond row, followed in the ſame manner: and, having gone through it, turn again to the firſt; and repeat the threſhing: proceeding in the ſame manner with the ſecond row. They have then finiſhed their work, as to the firſt quantity: and they continue to go on ſo in ſucceſſion with the reſt. But there are two men, called *ſhakers off*, who come immediately

immediately after them. The firſt of theſe throws the cole-ſeed up with a wooden fork; and the other ſtrikes it with an inſtrument of the ſame kind, as it riſes. This knocks the remainder of the ſeed out of the pods, or coſh; and frees it from the ſtraw: which, with the ſame forks, the two men convey from the cloth, over the bolſter to another man called, in this office, the *Jack Straw*; who takes it quite away. There are, alſo, two other perſons, one a woman, the other a man, who follow the ſhakers-off. Theſe are called the *before caver* and the *behind caver*. Their buſineſs is to take off the emptied coſhes; and the ſhort broken pieces of ſtraw, with rakes made for that purpoſe. The behind caver, who is a man, has very hard work, if he perform it with due care and activity: and on his dexterity and diligence, depends the ſaving a conſiderable part of the ſeed.

By this ſet of people, thus employed, in the caſe of a good crop, thirty combs, or one hundred and twenty Wincheſter buſhels, may be threſhed in a day. But, in the caſe of a bad crop, only ten or twelve combs.

The cole-ſeed, being thus threſhed, is left on the cloth, till the next morning: when the threſhers, with other help, go early, and caſt it on the cloth, to cleanſe it: after which it is immediately put into ſacks: and carried off in a waggon: ſo that the cloth is cleared, and

ready, againſt the others of the people come to work, if there be more to be done.

The produce of an acre of cole-ſeed, in a middling crop raiſed by this method of culture, is about ſeven combs or twenty-eight buſhels. The value of it at market is very uncertain: as ſuch value depends, on the ſeaſon, and other contingent circumſtances. Conſidering, however, that this method of managing the cole-ſeed is not expenſive in the work; —— the ſeed ſown a matter of trifling expence; being only half a peck for an acre; which makes the yield two hundred and twenty-four fold; — and the coſt of manure ſpared; as none is uſed but the burnt aſhes of the turf; — the cultivation of this plant muſt, of courſe, be attended with a conſiderable profit in this mode of it. For when the crop of ſeed ſucceeds, the double ſource of gain, from that and the paſturage, muſt render the whole great: and, when the crop of ſeed fails, the paſturage will more than indemnify the cultivator for the rent, ſeed ſown, and burning and plowing; which then make the whole expence: that of reaping being ſaved when the crop of ſeed is given up.

The foregoing are the methods purſued, where the plant is ſown at large in the field, where it is deſigned to grow. The other method of tranſplantation was formerly the only one purſued in England, in the culture of

of rape, for the oil: and is now practiſed, alſo, in ſome parts of Flanders in the culture of cole-ſeed. Poſſibly in very rich land, and where great quantities of manure can be beſtowed, this method, as it produces very great crops of the ſeed, is moſt profitable. But the other, where a dependance is principally had on the feeding cattle or ſheep, is more accommodated to general caſes. Where, however, it may appear beneficial to cultivate cole-ſeed after crops of grain, which cannot be got off the land ſufficiently early to admit of ſowing cole-ſeed on it the ſame ſeaſon,—the method of tranſplantation muſt, of courſe, be uſed. For which reaſon, as it may be an object worthy regard to raiſe cole-ſeed in this manner on very good land, where the procuring a quantity of green winter-food is caſually of great conſequence, and no adequate proviſion has been made for it in the ſpring, I will here give the particulars of the method, which long and extenſive practice in Flanders has rendered moſt approveable.

A fifth part of the land, on which the cole-ſeed is to be cultivated, muſt be prepared in the autumn and ſpring, preceding the time of ſowing. The other four parts may be employed for any crop, the ſame year the cole-ſeed is to be planted on it. The firſt fifth part is to be employed for raiſing the plantlings for the other four: and the tillage for the cole-ſeed may be begun as ſoon as

any preceding crop has been cleared off. The land ſhould have two plowings before winter, at ſome diſtance of time from each other; and the one ſhould, where practicable, be croſswiſe to the other. In the month of May, another deep plowing ſhould be given; after which the land ſhould be harrowed two or three times, and then rolled, in order to bring it to a good ſtate of pulveriſation.

Towards the 18th or 20th of July, the land ſhould be again plowed; and, alſo, harrowed and rolled, till it be perfectly fine. The ſeed ſhould then be ſown, in the proportion of eight pounds to an acre: and this is generally performed by ſprinkling it with the thumb and two fingers. The ground ſhould then be lightly harrowed, and rolled, to cover the ſeed. It is then left in this ſtate, till the ſeedling plants be ready for tranſplantation. The plants, raiſed thus on one acre, are ſufficient for planting four others.

The land, on which theſe ſeedlings are to be tranſplanted, may bear any crop the ſame ſummer; provided it be removed by the middle, or, at fartheſt, the end of Auguſt. It ſhould, as ſoon as it is at liberty, be plowed twice; and, ten or fifteen days afterwards, it ſhould be twice harrowed. The manure, if any be now uſed, is to be laid on and mixed with the ſoil in theſe plowings. About the end of September, it ſhould again have a deep

plowing;

plowing; and it ſhould then be formed into five-bout lands with deep furrows or trenches betwixt each. If there be any deſcent in the ground, theſe lands ſhould be laid in an oblique direction, that the water may paſs off the more eaſily.

The ground being thus prepared, in the beginning of October the moſt vigorous and promiſing plants ſhould be taken from the ſeedling acre; and, being tied in bunches, carried to it; in order to their being planted out. They are to be diſpoſed in rows acroſs the furrows: the rows being one foot diſtance from each other; and the plants ſix inches diſtant in the rows.

The manner of performing the planting is thus: A number of men advance; and, in a parallel line, make two holes in the ground at the diſtance of ſix inches from each other, by ſtriking a dibble, or fork, with two ſhort prongs, into the ground; taking care to keep the inſtruments, when they ſtrike, in a line with each other; and not to bring them nearer than a foot. Women or children, bearing the bunches of the plants, follow; and put the root of one into every hole: cloſing the ground to it afterwards with the heel of their ſhoe. By thus working, with both hands and feet, they make great diſpatch.

When the tranſplantation is finiſhed, if the land were not manured at the time of plowing, it is uſual to ſprinkle it over with

pigeons

pigeons dung, dried ſo as to be powdered. This is found to have the quickeſt effect of any ſpecies of manure. The quantity of this powder is ſixty buſhels to an acre.

After this, the looſe earth in the trenches, or deep furrows, is to be thrown by a ſhovel, or ſcooping-ſpade, amongſt the plants in the rows. A ſpit of earth ſhould be, likewiſe, again thrown, in the ſpring, out of the trenches into the intervals betwixt the rows of the plants. This tillage is of benefit to the crop in choaking the weeds; and keeping the ſurface of the ground in a ſtate to imbibe the moiſture.

The cole-ſeed will then grow a-pace, giving the lands the appearance of ſo many well-planted beds; and, if it thrive well, will fill up the ſpaces of the trenches; and make one intire thicket.

In the beginning of July, the ſeed is fit to gather: which is diſtinguiſhed by the pods turning yellow. But, if one part of the field be ripe before the other, it muſt be reaped ſeparately: and the gavels being left on the ground till the other part alſo be cut, they will take no harm. The firſt which is ready ſhould be reaped like corn: and the reaps laid in pretty large gavels on the beds. If the ſeed be ripe, this ſhould be done only in the morning, or evening: or a conſiderable part will ſhed and be loſt.

After

After the gavels have lain thus three or four days, they are carried to a proper place in order to be ſtacked. This is done in cloths, to keep the ſeed from being loſt: as a part of it will, of courſe, ſhed by the motion, when it is in a ſtate of dryneſs. This ſtacking may be performed, even though there has been rain within three or four hours: provided the reaped cole-ſeed has before lain a due time to dry. The ſtacks are formed in one or more parts of the field, according to convenience, with regard to the extent of the ground, and quantity of the crop. The Flemiſh farmers never thatch theſe ſtacks; but have the art of giving them ſuch a ſloping form, that the rain paſſes off without penetrating them ſo as to injure the cole-ſeed.

In theſe ſtacks, the herbage of the cole-ſeed ferments and heats: which ripens the ſeed; and makes it yield a greater quantity of the oil: but in the unripe ſtate it was reaped, it would, otherwiſe, be very defective without that operation. Where it is not to be ſtacked, it is, therefore, left to dry longer; but without great care, much of the ſeed will be then loſt in gathering the reaps together to threſh them.

In this particular of management, there is a very material difference betwixt the practice, before deſcribed, of our fen-farmers; and the Flemiſh cultivators of cole-ſeed: and it would be a point worth regard to determine, what

what the different proportion of oil would be in the ſeed of cole-ſeed, that had been ſtacked, and that which had been threſhed as ſoon as ſufficiently dry, without ſtacking.

The cole-ſeed, when ſtacked, is ſuffered to remain in that ſtate till the month of September: when a kind of flooring being made in the field, it is there threſhed; and the ſeed cleanſed.

The ſeed is cleanſed by means of parchment ſieves. If there be any current of wind at the time, advantage is taken of it for winnowing: but, if not, wind-fans are uſed; as for grain.

The ſeed is then carried to the granary; and, being frequently ſtirred, is kept there till it be ſent to the mills, or the market.

That ſeed which exceeds moſt in drineſs and weight, is judged the beſt: but it is uſual, alſo, to break ſome of the grains on a table; and obſerve how they appear to abound in oil: for, by this criterion, the dealers, who have experience, can judge accurately of the value.

The crop remaining in the acre, on which the ſeedlings were raiſed for tranſplantation, is not ſuffered to grow for ſeed, but eaten off by cattle; except where the land is manured for another crop. But this depends on convenience of circumſtances. For more than a ſufficient number of plants being left after the others are drawn, they may be eaſily reduced

at

at any time, by hoeing, to the ſame ſtate with thoſe on the four acres of the tranſplantation.

It is practiſed, in ſome places, to make furrows at the due diſtance, by means of a proper plow; to lay the plants correſpondently in theſe furrows; and then to cover them, by throwing in the earth. But this method is far inferior to that of planting by the two-pronged dibble: unleſs where it becomes neceſſary from any delay of the tranſplantation, which may render the roots too long to admit of having holes made for them, by the dibble, of ſufficient depth.

The above are the material particulars of the method practiſed in moſt parts of Flanders, where the cole-ſeed is raiſed for the ſake of its oil. But there are other places where the cole-ſeed is ſown at large in the field, where it is intended to ripen.

In Flanders, the cakes of the ſeed are uſed for feeding neat cattle and ſheep, in the manner of the linſeed-cakes here. But with us, they are only employed as manure: the cattle being found to refuſe them. It appears, that this is owing to a want of the knowledge of the expedient made uſe of in Flanders, for rendering them palatable to theſe beaſts. This is the powdering them; and mixing them with bran: in which ſtate the cattle do not reject them. It is obſerved, that the cows fed with them give very copious meals of milk.

The

The pods or cavings of the ſeed, as well as the little tufts of leaves on the plant, are readily eaten by both cattle and ſheep. And they are laid up carefully from wet, to be kept as a winter-fodder. The ſtalks are, alſo, uſed in Flanders for heating ovens; making beds for barns; and ſometimes for manure. But they require conſiderable time to rot.

The crop of ſeed on an acre in Flanders is computed, one year with another, at eight pounds ten ſhillings ſterling value. It is, at preſent of much higher price here. In places, where there are no mills near for preſſing the oil, there may be ſome difficulty in diſpoſing of the ſeed. But this cannot hold good of any ſituations, whence it can be conveyed, at a moderate expence of carriage, to London: as a market will always be immediately found for it there. Cole-ſeed ſhould not be cultivated more than once in four or five years on the ſame land: but it may be raiſed on land newly broken up; or ſuch as has had other crops the preceding four years. In fen-land, according to the method preſcribed, the expence being ſmall, and conſiſting almoſt wholly in labour, it affords good profit from its advantages in feeding ſheep. In a very rich land, or where there is great plenty of manure, the other method of tranſplantation affords a great return in the oil: and the land will be in good condition, and tilth, for any other crop, when this is reaped. On the whole,

whole, it appears, that this plant may be cultivated in a great number of places, where it is now neglected, to the benefit both of the farmer, and the public.

I have, therefore, given the various methods, by which cole-ſeed is cultivated both in our own country, and abroad. And I have not confined my account only to what is practiſed with a view to the feeding of neat cattle and ſheep, or that intention jointly with the obtaining the ſeed for oil; but taken in, alſo, what reſpects the culture, where the production of the ſeed for oil is the principal concern: as there is a great connexion betwixt the two views: and what is done in one ſerves much to illuſtrate the reaſons of proceeding in the other. I have, likewiſe, endeavoured to point out the principles on which the variation of theſe methods are founded; and on which, each may be deemed in ſome particulars defective, where they are too generally adhered to.

From this ſurvey of the ſeveral modes of practice, and the circumſtances under which each has been inſtituted, important lights may be gained, by thoſe who purſue any of them from local uſage, for introducing improvements from the hints furniſhed by the other. Original cultivators, alſo, will be thence enabled to form a judgment from the whole, whether the adopting any of theſe methods ſimply, or combining certain particulars, of

any of them, to form a new mode of practice, may beſt ſuit the circumſtances of their undertakings, with reſpect to ſoil; intention ſolely of feeding cattle and ſheep; or of that and reaping the ſeed concurrently; under which they enter on the culture of this plant in large, or to make experimental trials. Without ſuch collective information, the efforts of the Society, to produce a more general cultivation of any plant, at preſent, known only to particulars, can have but a ſlow and languid operation: as the people, who are ignorant of the advantages of any ſuch plant, are alſo ignorant of the way to gain them; and deſtitute, for the moſt part, of the means of acquiring adequate knowledge of that way.

R. DOSSIE.

ARTICLE

ARTICLE IX.

Account of a Method of Brining Corn, to prevent Smut; with general Obſervations on the Nature and Cauſes of Smut; communicated by Mr. REYNOLDS *to the* Society for the Encouragement of Arts, Manufactures, and Commerce; *and inſerted at their Requeſt.*

To *Robert Doſſie*, Eſq.

SIR,

I Am directed by the Society for the Encouragement of Arts, Manufactures, and Commerce, to ſend you Mr. REYNOLDS' Letters on the Brining and Liming Wheat, and the Nature and Cure of Smut in Corn; in order to their being inſerted in the Memoirs of Agriculture, &c. if you think proper.

By Order of the Society,

PETER TEMPLEMAN, Secretary.

To Dr. *Templeman.*

WORTHY SIR, Adiſham, Nov. 3, 1768.

FINDING what has been communicated by me, relating to huſbandry and agriculture, &c. acceptable to the Honourable

Society for the Encouragement of Arts, &c. and being willing to render myſelf as uſeful as I poſſibly can to the community, and withal to oblige thoſe reſpectable gentlemen you have the honour to repreſent, I ſhall, by your means, lay before them a very uſeful method, that I have long practiſed, to prevent the ſmut in our wheat-crops. A thing of no ſmall conſequence to the public in general; but extremely prejudicial to the farmer; and which makes our bread both black and ill-taſted too.

The following recipe will aſſuredly prevent the ſmut; and render both the ſowing, and the drilling of the wheat much more eaſy and certain, (I mean as to quantity of produce) than any other method hitherto practiſed, that I ever heard of, by the following pickle.

A tub is to be procured, that has a hole at the bottom; in which a ſtaff, and a tap-hoſe, are to be fixed over a wiſp of ſtraw, to prevent any ſmall pieces of lime paſſing, (as in the brewing-way). This done, put in ſeventy gallons of water; and then a corn-buſhel heaped full of ſtone-lime unſlaked: ſtirring it well till the whole be diſſolved, or mixed; and letting it ſtand about thirty hours. Afterwards run it off into another tub, as clear as may be, in the manner practiſed for beer. This generally produces about a hog-ſhead of good ſtrong lime-water. To this add three pecks of ſalt: which will weigh forty-two pounds; and, with a little ſtirring, will

ſoon

ſoon diſſolve. Thus there is obtained a proper pickle for the purpoſe of brining, and liming the ſeed-wheat, without any manner of obſtacle. This is preferable to the common way; and greatly facilitates the drilling, where that method of culture is uſed.

In this liquor ſteep the wheat in a broad-bottomed baſket of about twenty-four inches diameter, and twenty inches depth, made on purpoſe for large ſowings: running in the grain gradually in ſmall quantities, from ten or twelve gallons up to ſixteen gallons, ſtirring it. "What floats muſt be [illegible] with a ſtrainer; and muſt not be ſo[illegible] low up the baſket, to drain o[illegible] for a few minutes.—The whole [illegible] operation may be performed within half an hour; and the ſeed will be duly pickled. After which proceed as before.—This done, the wheat will be fit for ſowing in twenty-four hours *, if required. But if

* The Society, having thought proper to publiſh the above recipe in ſome of the news-papers, added the following *Nota Bene:* "Since the above communication, the "Society have received information, that, on experiment, it has been found, the wheat may be ſown in "two hours after its being put into the brine; provided "the brine be ſtrong enough; and due attention has "been paid to the ſtrength of the lime-water." It was thought proper, by the Society, after they were apprized of this fact, to give an intimation of it to the public. Becauſe inſtances, may happen, where a fair opportunity may offer to the farmer of ſowing his wheat, which might probably be loſt, if he were to wait a day or two, for the

deſigned for drilling, it will be found beſt two days after the pickling. And if it be prepared four or five days before-hand, in either caſe it makes no difference at all, that I know of. But, in the caſe of drilling, ſhould the ſeed be clammy, and ſtick to the notches in the drill-box, more lime muſt be added to the *lime-water*. Here the maſter muſt uſe his direction, as the caſe requires. For ſome lime has much more drying and aſtringent qualities in it than other.—If ſea-water can be obtained conveniently, leſs ſalt will [illegible]. But ſome will be found neceſſary: otherwiſe light grains will [illegible] which is of more conſequence [illegible] rally imagined. Theſe light [illegible], therefore, to be carefully ſkimmed off and thrown aſide for poultry, &c.

Gentlemen, I ſay this from well-grounded experience: having practiſed this method for thirty years paſt; and never had any black wheat, when the ſeed was prepared as above, either for ſowing in broad-caſt, or drilling *, in a great variety of ſoils; and on large quan-

preparation of his ſeed-corn by brining. The method is, therefore, rendered more generally uſeful, by ſhewing, that the reſtriction of not ſowing under twenty four hours may be diſpenſed with, where inconvenient. R. D.

* The uſe of this method of brining and liming the ſeed-corn, may be of great conſequence in facilitating the practice of the drill-culture. The ſuppoſed neceſſity of employing lime in ſubſtance, has been frequently a great impediment to the ſucceſs of drilling, by cauſing an obſtruction

tities of land too. This is confirmation enough for me to continue its practice: and ſeeing thus its utility, I throw another mite into the Society's noble Treaſury of Arts, &c. for the benefit of my countrymen; which, I truſt, will be acceptable.

I am, my Lords and Gentlemen,

Your moſt dutiful, humble ſervant,

JOHN REYNOLDS.

To Dr. *Templeman.*

SIR; Adiſham, Nov. 4, 1768.

A better underſtanding of my letter yeſterday, I would add, by way of poſtſcript, the under-written: which, perhaps, may render my communication more ſatisfactory, in ſome particulars, than it now is; and explain what may ſeem abſtruſe in the latter part, where I ſpeak of the ill conſequences relating to light grain, &c.

ſtruction to the diſcharge of the ſeed from the drill-boxes: and a very unequal diſtribution of it in the furrows: as appears from the facts mentioned by Sir Digby Legard, in article VI.; and by others, who have given accounts of their experiments in drilling.

This difficulty is entirely removed by the means here propoſed for the preparing the wheat by a ſolution of the lime in the brine: which ſeems, at the ſame time, to anſwer effectually all the purpoſes of uſing lime in ſubſtance. R. D.

POSTSCRIPT to the preceding [illegible]

THAT many of the deformed light grains eſpecially, are often infected, or charged with ſmutty qualities, in caſe they grew where there was an appearance of ſmut near them, is, I am confident, very certain. And, no doubt, theſe very grains are capable, by the matter contained in them, of conveying this diſorder to the ſound. Thus a ſucceſſion is kept up from one generation to another without end.—But, in what manner [illegible] is propagated; and how conv[illegible] creaſed; the learned are not [illegible] can I pretend to ſay any [illegible]

However, this is moſt probab[illegible] imperceptible inſects, that, a[illegible] lodge in the ſeed-veſſels, *farina* like[illegible] bring on a ſtate of corruption, [illegible] turn to a black ſtinking powde[illegible] perhaps, with numberleſs animalcules, &c. PARENTS OF THIS DISEASE.

Happy it is, we have a remedy before us, that will effectually prevent its ſpreading.

To Dr. *Templeman.*

WORTHY SIR, Adiſham, Nov. 20, 1768.

ACCORDING to promiſe, you have here a more perfect account of ſuch obſervations, and remarks, as I have made for many years paſt,

paſt, relating to the cauſe, and pernicious effects of ſmut, more diſtinctly ſet forth in all reſpects, I think, than has been heretofore done, by any one that I know of.

The particulars I am going to mention are ſelected from my memorandums, made from 1730 to 1739, of the reſult of a number of experiments, and trials of divers kinds, too numerous to be recited in this place. Wherefore, I ſhall now confine myſelf chiefly to point out the cauſe, and the [illegible] conſequences of this diſeaſe in corn.

[illegible] two kinds of ſmut, both found to [illegible] cial to corn; but which affect it [illegible] ect.—The one I ſhall call *open* or [illegible] and the other, being the ſhelly incu[illegible]d, *bag ſmut*; which is the common name of it here. Both of them are but too well known to the land-holders; only with this difference; that the looſe ſmut is thought inſignificant, or much leſs injurious than the other.

My opinion is, however, quite the reverſe. And dare pronounce, that both thoſe diſorders proceed from a like cauſe: which is the infection of inſects; or ſome kind of ſmall animals, ſuch as the learned call animalcules, generated in the plants; and from no other cauſe whatſoever. For we ſee the open looſe ſmut either more or leſs affects the reed-tuft; and extends itſelf not only to wheat but alſo to rye, barley, and oats: and,

with reſpect to the two laſt, to a very high degree: inſomuch, that it is [illegible] to ſee a twentieth part thus infected. And there does not even want inſtances of an eighth, or a ſixth part, being thus *blighted*; as the farmers term it.

We may, therefore, ſee that this diſorder is more prejudicial than the other ſpecies; becauſe it is more univerſal. Nevertheleſs, the evil is in a great meaſure overlooked, or diſregarded: notwithſtanding it greatly leſſens the product of the land, according [illegible] grain happens to be more or leſs [illegible] the diſeaſe. But yet we [illegible] complaints concerning this [illegible] ſon of which I take to be this [illegible] been, and ſtill continues a re[illegible]ion, that this kind of ſmut proceeds from a natural cauſe of decay, either in the root, or ſeed: and it is no further examined. The product, or ſubſtance being blown away, ſpent, and left in the fields, little or none comes into the barn to affect the grain with blackneſs, as the other does. Whence it is concluded to be (as I ſaid before) quite inſignificant: a mere nothing. However, this is certainly a great miſtake.

In order to remove theſe prejudices which are very injurious, I intreat, that it may be conſidered, this powerful enemy never fails conſtantly to make its appearance in the fields, when the grain is coming into bloom and is

ſeen

ſeen at no other ſeaſon but when the corn is [illegible]. This is a very remarkable circumſtance, which I deſire may be particularly obſerved; becauſe accidents, and defects, &c. ſo often pleaded, can have no part at all in the cauſe: ſeing it is thus regular in its courſe. We may, at this time, behold the habitations of theſe animals broken down, and ſhattered all to pieces; their proviſion gone; and the whole ear devoured; nothing being left but the black duſky particles, intermixed with the eggs and progeny of ſuch inſects, as brought on the cauſe.

From hence, the ſound corn certainly becomes infected, by their *ova* or eggs falling in with the *farina*, at this juncture, while the corn is forming. This accounts for thoſe deformed light grains, that we know are infected with ſmutty qualities: and it is eaſy to conceive how this duſty progeny may be conveyed into the ſeed-veſſels of the corn, by the air; and, in proceſs of time, devour that matter, which would otherwiſe have produced the grain: of whatever ſpecies nature deſigned; whether wheat, rye, barley, or oats. This I take to be the caſe: and we have woful experience to confirm it.

The other incruſted enemy, or *bagg*-ſmut brood, act, indeed, more privately; and occaſion the greateſt diſorders among the wheat, when it comes to maturity. Becauſe its blackneſs renders it odious, and ſometimes totally

totally unfit for bread. Theſe vermin ſtick in the outward coats; for wheat having their abode in the barn; eſpecially after threſhing: when the baggs are broken; and the grain becomes mixed. Their exiſtence, is, however, but of ſhort duration. For unleſs the grain be committed to the earth in due time, they certainly periſh. Becauſe, we find, from well-grounded experience, that old ſeed, ſown in its natural ſtate, is free from ſmut in the next generations: as numbers can witneſs. And we have recent inſtances to confirm this even in the laſt year's growth. For none of the foreign wheat, that is one, two or three years old, ſown in theſe parts, had any ſuch diſorders.

But, with new ſeed, the caſe is manifeſtly different. The enemy ſtands at the door of vegetation; paſſes along, when it is open, as the plant advances; unites afterwards with the floury ſubſtance deſigned for food; and, in the end, devours that matter, which would, otherwiſe, become flour in the grains: leaving, inſtead of it, a noxious black powder infected with the eggs, brood, and excrements of the inſects: hences comes that offenſive ſmell.—This accounts for the diſeaſe; and ſhews us pretty plainly, that it proceeds from inſects, and vermin, &c. only. The explanation here given may ſeem myſterious to many. But to proceed, when the grain is put into a growing ſtate, the organs ſoon become

ome expanded divers ways, for the circu-
ation of the juices, that form the root, ſtem,
eaves, and ear, &c. neceſſary for bringing
he fruit to perfection: and, from hence we
nay be led to conceive how, when the
egetation is begun, theſe minute creatures,
which firſt but lodged without, may after-
wards creep into theſe tubes, or veſſels, dur-
ng the time their own ſtate requires, when
he corn is growing; and how both them-
ſelves and the plant arrive at maturity, at one
and the ſame period together.

This is very ſimilar to other productions,
hat we are certain of. Such as are found in
the pods of beans, peas, hemp, hops, flax,
ſtone-fruits, nuts, &c.; and can any one aſ-
ſign a good reaſon, why they may not take
place in wheat, rye, barley, and oats, like-
wiſe. Here I ſtand upon firm ground: for
none can diſpute this.

Finding inſects the cauſe of ſmut, I invent-
ed the pickle above ſpecified, to deſtroy their
brood: and it has effectually anſwered the
purpoſe ever ſince, for about thirty years paſt;
and rendered the grain better, both for ſow-
ing and drilling: ſo that I flatter myſelf, to
have found out as well the cauſe as cure of
ſmut: things eſſential; and worth due ob-
ſervation. My dutiful reſpects attend the
honourable Society: and I am,

Sir, your affectionate humble ſervant,

JOHN REYNOLDS.

ARTICLE X.

Obſervations on Pine-trees, and Larches; reſpecting the Advantages of planting them, and ſome uſeful Particulars in the Method of it: communicated in a Letter to the Editor.

To *Robert Doſſie*, Eſq.

SIR,

I Have peruſed your publication with pleaſure: and have ſent for your inſpection, ſome obſervations, that I have made on pines, firs, and larches. If they contain any information, that may be of ſervice to planters, you are at liberty to inſert them in your Memoirs: otherwiſe, I deſire you to commit them to the flames. According to your promiſe, I deſire you will correct all inaccuracies of ſtyle, as I have only attended to facts.

Flumen amem, ſylvaſque inglorius.

OBSERVATIONS on Pines, Firs, and Larches.

IN raiſing theſe trees, care ſhould be taken, that they are ſkreened from much ſun: and it is neceſſary, the beds ſhould be covered with nets, till the ſeed falls from the head of the young plant. They ſhould be removed once

once, or twice, before they are planted out [illegible] at which time, they ought not to be above four foot high: and may be put from four to ſix aſunder. At ſix foot there will go twelve hundred and ten to plant an acre. They ſhould be thinned gradually: and, in twenty years, only ſuch numbers ſhould remain, as may be left for timber. I believe, they do not require a greater diſtance, than four yards; ſo that two hundred and forty may remain on an acre. That they do not require more room (eſpecially the Scotch fir.) I infer, from the fir's being a tree, which does not extend its branches to a great diſtance;—and from having ſeen them thrive well at that diſtance: the reaſon of which I imagine to be this. Hales, in his Vegetable Staticks, hath proved, that all evergreens perſpire much leſs than deciduous trees; and, as they require nouriſhment in proportion to the quantity perſpired, conſequently require leſs. This, with their growing ſtreight to a great height, and in a ſhort time *, is a great advantage.

* It appeared, from accurate obſervations made on the meaſurement of twenty ſpruce firs, tranſplanted at the age of two years, to a mountainous, barren, gravelly piece of land, that they were, after ſtanding eleven years, on an average one with another, thirteen feet, eight inches high; with ſtems nine inches in circumference, at two feet from the ground:—and that twenty Scotch firs, under the ſame circumſtances, were ſixteen feet ten inches high; with ſtems ſixteen inches in circumference, at two feet

A very judicious and experienced planter of theſe trees, told me, "That to have them "tall, ſtreight, and clear of knots, they muſt "be planted to ſhelter each other; and "that, though they would not increaſe in "bulk quite ſo faſt, the wood would not "have that ſponginеſs, and coarſeneſs of "grain ſo frequent in Engliſh deal." Many of his plantations are on very ſide-land grounds; and the ſoil, in different parts cold, ſhallow, wet, or dry. Indeed, I have ſeen them grow well in almoſt every ſoil, and ſituation. The noble plantations of them at Wooburn, made by the duke of Bedford, are in a poor dry ſand. By the ſide of theſe, they come up naturally: ſo that this kind of ſoil ſeems peculiarly adapted to them. A ſimilar inſtance, I have ſeen, in that part of the kingdom, in which I reſide: and, in two inſtances, I have ſeen them grow from a crevice on the top of a wall.—With us, we are far from being in that ſtate, with regard to timber, which hath univerſally been complained of, by every writer on the ſubject. That it diminiſhes with us is moſt certain. There hath

ſcet from the ground. It further appeared, from the meaſurement of ten larches, tranſplanted at the age of two years, to the moſt northerly expoſed part of the ſame place, that, after ſtanding nine years, they were, on an average, ſixteen feet high; with ſtems twelve inches in circumference at two feet diſtance from the ground. R. D.

been

been ſad havock made, within the laſt twenty years. And, as we have ſome thouſand acres of land, that bring in ſcarce any value to the proprietors, I could wiſh to ſee part of them converted into foreſts of theſe trees. The ſoil is, in general, much ſuch as where I have ſeen them come up naturally: at top very looſe, frequently of a red or black colour; under this often a ſtrong ſoil, as favourable to their growth, when they are of ſome ſize, as the other is, while they are ſmall.

The land may be prepared, and ſown, as for wheat. It appears good management of this kind of woods, to cut off the under-branches of ſuch trees only, as you intend to take out in thinning them. By this means, theſe trees may remain longer without injuring thoſe which are to ſtand for timber.—I believe theſe trees come to perfection in fifty or ſixty years. I know three inſtances of them much older: large trees which have not grown after that time. — I wiſh, I could give a ſatisfactory account with regard to the value of Engliſh deal. I have converſed with gentlemen, and timbermen on this ſubject. The latter ſay, the value of it is very inconſiderable: and carpenters give much the ſame account. By one gentleman, I was informed, that he had made good wainſcot of it. By another, that he had been obliged to uſe it for fuel: as no one would offer him any thing

thing for it *. One, of the many advantages, that will ariſe from your work, is, that private individuals may procure intelligence from others, on any points material to them-

* It ſeems incumbent on the Society for the Encouragement of Arts, Manufactures, &c. as they are endeavouring to incite the cultivation of firs, by the offer of their honorary premiums, to have this point well decided. If the timber be not of any value, they are rather injuring than ſerving the public, by the meaſures, they purſue to increaſe the cultivation of the trees. If it be valuable, the removing the preſent doubts on that head, entertained by many, would very much promote the influence of their premium. I ſhall, therefore, do my utmoſt to procure their attention to this matter. In the mean time, I am apt to believe, that the reaſon of the difference of opinions in this point, has taken its riſe from the variation of the qualities of the timber itſelf, raiſed in different ſoils and ſituations. General experience, and obſervation on the vegetation of trees, makes it evident, that the ſame kind ſtanding on dry ſoils, and with cold expoſure, if the trees retain their health, produce much harder timber than thoſe, which, in conſequence of warmth and moiſture, are more luxuriant in their growth, and more replete with ſucculence. This holds good particularly of evergreen and terebinthinate trees.—On what principle, elſe, can we account for the difference of our timber from that produced, on the continent, from the ſame ſpecies of trees.

If the gentlemen, who are poſſeſſed of mature timber of any of the fir-kinds, will communicate their obſervations on this head, they ſhall be carefully tranſmitted to the public in this work: and, from a moderate ground of poſitive facts, this point would ſoon receive a ſufficient elucidation, to enable us to determine, how far, and under what circumſtances, the planting firs may be advantageous to the proprietor and the public. R. D.

ſelves,

ſelves, or their neighbours. I have raiſed ſome thouſands of the Scotch fir. But, as it behoves me to plant for profit, as well as ornament, I requeſt, that ſome one would ſatisfy me with regard to the value of this timber, when of Engliſh growth. In every other reſpect, I am ſatisfied, there cannot be a more profitable tree planted.—There is another point, I want to have cleared up. Part of the land, I intend to plant theſe trees in, is rather wet. In one of the foreign eſſays on agriculture, are the following words: "Firs, if they only required a great deal "of nouriſhment, without any regard to its "nature, what tree ought to ſucced better in "wet or even marſhy ſoils: as their wood "is porous and ſpongy? Yet, in ſuch ſoils, "their wood is abſolutely unfit for uſe. It "is well known, that, if their roots pene-"trate to any water, or even to a ſoil too "moiſt, the trees begin to rot at bottom, "before they have attained a third of their "natural growth. Such as grow in ſoils, "that are rather dry than moiſt, thrive very "well; but it is certain, their wood is more "ſpongy; and does not laſt ſo long as that of "trees, which grew in a dry, ſtrong, or gra-"velly ſoil. The reaſon is ſelf-evident. The "juices and ſalts, to which water ſerves as a "vehicle, do not agree with the nature of the "wood. It requires others which can form "a reſin."

The common Norway ſpruce-fir is ſubject to an inſect, that deſtroys the leading ſhoots, and end branches. The white American ſpruce is ſaid to be free from it. From its appearance, when young, I ſhould imagine, it grows as faſt as the Norway ſpruce.—In the moor-lands, in Staffordſhire, I ſaw an avenue of the ſilver fir: and was, informed, they were about one hundred years growth; but had not increaſed for thirty or forty years. As near as I could gueſs, they were from ſix to eight feet round; and from fifty to ſixty in height.

The wood of the larch-tree, according to the account given of it, by the very ingenious and agreeable writer of the Eſſays on Huſbandry, is poſſeſſed of as many valuable qualities as any tree that grows. I have ſeen one, that was planted in the year 1737, which is now five feet in circumference, and above ſixty in height; and others, not above ſixteen years from the time of their being planted, that are now upwards of four feet round, and above forty in height. The above-mentioned writer ſays, "That though it grows "but ſlowly for the firſt four years; yet, in "twenty years, it will exceed a fir-tree, in "girth and height, that is of double its "age." I make no doubt, but that ſo ingenuous a writer hath ſeen inſtances of it; or he would never have aſſerted it. However, as I knew the fir-kind were very quick growers,

I took

I took ſome notice of the difference in growth in theſe trees: and I find it not ſo great as he hath repreſented. In the ſame number of years, they may exceed the others a third or fourth in height; and nearly a fourth in bulk. Though I am not very certain, whether the growth of the larch is ſo very quick after the firſt twenty years. — I have meaſured the circumference of ſome Weymouth pines (my favourite trees). One, that had been planted ten years, was twenty-two inches in girth: another, planted eight years, was eighteen. They were planted when about four foot high. This is confirmed from an account of the increaſe, in one year, of a Weymouth pine, inſerted in Marſham's very accurate Obſervations on the Growth of Trees in 1757. The circumference of this pine, at five feet from the ground, was one foot ſix inches and two-eights of an inch: and, in 1752, it was one foot nine inches. I here recommend it to you to publiſh his obſervations in your collection; they appear to be very uſeful; and, I believe are only to be met with, in the ſecond number of the fifty-firſt volume of the Philoſophical Tranſactions: and, conſequently, may fall into the hands of but few perſons. I have thoughts of making the ſame kind of obſervations; and ſhall communicate them to you.

I have ſeen quotations from a work of Du Hamel's, *Des Arbres*. I ſhould imagine, from this writer's very uſeful experiments on agriculture, that thoſe, he hath made on trees, are not leſs ſo. I ſhould, therefore, imagine, that you may very properly introduce ſome extracts out of this work into yours: as it hath not yet been tranſlated.

I am doubtful, whether the Weymouth pine, or the larch-tree, will, in twenty, or thirty years, turn out the greateſt quantity of ſolid timber. It is a hardy tree. No tree removes better than this does, about the end of March, or beginning of April. The year it is removed, it will make a conſiderable ſhoot. It extends its branches very wide; and, therefore, requires, as well as the larch, to ſtand at leaſt a yard more aſunder than the Scotch fir. I believe, it is not nice in its ſoil. It thrives well in the ſandy ſoil at Wooburn. If any credit is to be given to the account of travellers, or the perſons I have converſed with, who have been in America, this is the nobleſt tree of the pine, or fir-kind.—I caution every planter, not to plant any of the above-mentioned trees ſingle, nor in avenues, or hedge-rows. They not only, in ſuch a ſituation impoveriſh the land; but ſcarcely ever make fine trees: and the bad appearance they generally have, when treated in this manner; and the injudicious method of planting them, after they are of a conſiderable height

height and bulk; hath been the great obſtacle to theſe trees not being more generally planted. If ever it were adviſeable to plant them wide, the ſituation ſhould be low, and ſheltered, particularly from the Weſt. — Marſham very properly recommends, to defend theſe trees by an out-line of beech. This tree, from its ſending forth great plenty of branches, and preſerving frequently its leaves during the winter, ſeems beſt adapted for that purpoſe.

I was pleaſed to find the Society have engaged with a perſon, who is to ſupply the candidates for any of their premiums, with plants, or ſeeds, good, and on reaſonable terms*. As well as others, I have been diſappointed in the ſeed of trees, I have been ſupplied with from London: and, what is worſe than the trouble and expence, in vain have loſt time, ſo precious to all planters. I think it worthy the Society to have a ſkilful agent in America, who ſhould collect for them the ſeeds of ſuch trees, and plants, as there is a probability of naturalizing in this kingdom; and to appoint a perſon to ſupply gentlemen

* This refers to a *Nota Bene*, inſerted by the Society at the end of the firſt premiums for Agriculture, in the following words: "The *trees*, *plants*, *cuttings*, and *ſeeds*, "for which the Society have offered the above pre- "miums may be had of *Mr. Shields*, *nurſery-man*, *at Lam-* "*beth*: who has undertaken to furniſh the ſame, good, "and on reaſonable terms." R. D.

in the country on reaſonable terms, and with ſuch ſeed as they may depend upon. — I am very anxious for the ſucceſs of your work. The ſubjects it treats upon, particularly agriculture and planting, I am very fond of. Hitherto I have made little further progreſs in them, than from reading the beſt authors, and obſerving the event of what is practiſed by others.

I hope ſoon, however, to engage in them myſelf: and though my experiments may not be large, yet I intend, that they ſhall be in great variety: and the good or bad ſucceſs of ſuch, as ſeem worthy your attention, I will communicate to you.

I am, Sir, your humble ſervant,

A. B.

I muſt own, I ſhould place a greater confidence, in ſuch of your correſpondents, as ſign with their real names; and yet I have not done it myſelf. I have reaſons for omitting it at preſent. Hereafter I may own this, and any other letter you may receive from me.

ARTICLE

ARTICLE XI.

OBSERVATIONS *on the Contents of a* TREATISE ON THE DISEASES OF CORN, WHILE GROWING; *written in Italian, by the Count* GINANNI; *and lately preſented by him to the* Society for the Encouragement of Arts, Manufactures, and Commerce.

THIS work is intitled, *Delle malattie* DEL GRANO IN ERBA, *trattato ſtorico-ſiſico del* CONTE FRANCESCO GINANNI *patrizio Ravennate, con note perpetue ad eſſo trattato, e con altre oſſervazioni di ſtoria naturale del medeſimo.* The author has treated this difficult and complex ſubject in the moſt learned and elaborate manner. He has conſulted almoſt every former writer, antient or modern, known to him, who has touched either profeſſedly, or caſually, on any matter, that relates either to the cauſe or remedy of thoſe natural accidents, by which corn is liable to be injured in its growing ſtate. And he has amaſſed together the ſeveral opinions of theſe authors: adding to them his own; ſuch as his reaſoning on principles, or examination of facts, have furniſhed him with, on each head.

It were much to be wiſhed, nevertheleſs, that the Count's experiments had been as ex-

tenſive as his reading: and that, to obtain the due lights into this important ſubject, he had applied to the diſquiſition of nature, a greater proportion of the time and attention, which he beſtowed on books. For writers in general, eſpecially thoſe of earlier times, furniſh little on theſe ſubjects to the reader, but ſlight, and partial accounts of facts; groundleſs and wild hypotheſes; and ſpeculative diſputes on trivial points, or frequently on ſuch as have no foundation in the reality of things.

The juſt method of inveſtigation, by an actual and expanded ſurvey of what is really preſented by nature and facts relative to the object of inquiry, is but lately introduced: and the concluſions formed on any other baſis are neceſſarily confined, uncertain, and deluſive. It is not, however, here implied, that there is a neceſſity, every perſon, who attempts to form a ſyſtem of knowledge on any ſubject of this kind, ſhould reſtrain himſelf to the limits only of ſuch matters, as he is acquainted with from his own perſonal inſpection, or trials: which would, in general, afford only a very narrow field: though he ſhould always either proceed on the foundation of them; or of thoſe, he collects from the relations of others, which are well authenticated. But, in moſt of the earlier authors; and, indeed, in too many of the later; we ſee, with reſpect to natural hiſtory,

tory, and the philoſophic doctrines which depend on it, ſo little regard is paid to the examination of real facts; and ſo implicit a deference and ſervile purſuit of what has been before written adopted; that the moſt abſurd notions, which ſordid ignorance and wild credulity could lead to, are introduced, and propagated.

Count Ginanni's work is, therefore, rendered much more voluminous and diffuſive than neceſſary: a conſiderable part of it being principally compoſed of inquiries into the uſe and original of the names, in the antient and modern languages, of the matters he treats of; of the vague and contradictory accounts and opinions of authors reſpecting thoſe matters; and of his own comments on them. But as it contains, nevertheleſs, almoſt every thing before broached on the ſubject; and, amongſt other matters, ſeveral juſt obſervations formed on his own trials, and examination; it conſequently preſents the good as well as the bad; and, therefore, merits attention: as it affords room for a ſelection of ſeveral articles; which may yield uſeful information to the more ignorant, with relation to practice; and ſupply aſſiſtance to thoſe, whoſe ſpeculative views engage them in the purſuit of diſcovery and improvement.

The Count Ginanni, in this work, has enumerated FOUR *principal diſeaſes*, to which corn

corn is ſubject while growing. He calls them, LA RUGGINE DEL GRANO: — LA FILIGINE DEL GRANO: — IL GRANO CARBONE: —and IL GRANO GHIOTTONE.—It is difficult to give a verbal tranſlation of theſe names into Engliſh: as neither common obſervation with us, nor any of our writers on theſe matters, have reduced this ſubject the ſame ſyſtem: and we have not, conſequently, any words in our language, that, according to their *general* uſe, anſwer determinately to theſe, which the Count has adopted. For thoſe Engliſh names we have of the diſeaſes of corn, are different in different places of the country; and are no where uſed with much preciſion, as to the nice diſtinction of one diſeaſe from another.—I ſhall, therefore, in exhibiting the particulars worthy notice, which the Coun has advanced on each of the diſeaſes enumerated, adopt that Engliſh word, by which we moſt commonly expreſs the ſame diſeaſe, as far as general obſervation has made it known: and, where ſuch word fails to expreſs the whole ſenſe of the term he uſes, I muſt have recourſe to a detail explanation. I will not, however, follow the Count's example; and take up the reader's time, by diſcuſſions on the manner, in which our writers vary from each other in the uſe of names: nor how far they have erred with relation to the meaning of them. Though ſome of our dictionaries, as well as the treatiſes, which

which have had occaſion to mention the natural morbid accidents to which growing corn is liable, have groſsly blundered both as to the words, and facts.

The RUGGINE DEL GRANO, which is the *firſt* kind of diſeaſe treated of by the Count, may be beſt tranſlated by the word BLASTING: as being the moſt general name uſed with us to expreſs the ſame manner of corn's being affected. It ſhews itſelf firſt by the diſcolouring of the blade, or ſtalk, in ſpots, or whole parts: which appear yellowiſh, reddiſh, blackiſh, or of a withered hue; and ſometimes of all theſe colours, together, on different parts; or by ſucceſſion in the ſame. It is frequently attended, alſo, with an unequal riſing, or bliſtering of the outward coat; and, in ſome inſtances, with the appearance of a duſty ſubſtance on the ſurface. All theſe accidents happen at different ages of the plant: but moſt frequently, while it is in blade: and they terminate ſometimes only in the withering of the part affected; ſometimes in the barrenneſs of the plant, which then yields no ſolid ſeed; and ſometimes in a mortal decay of the whole; according to the degree of the cauſe, the prediſpoſition of the plant to be affected by it, and the importance or number of the parts injured.

The cauſe of the *ruggine* or *blaſting*, appears, as well from the attendant circumſtances of its attacking the plants, as from the particular

ſymptoms

ſymptoms or effects produced, to be the inclemency of weather, either with regard to the extraordinary rigour of cold, or the too ſudden and frequent tranſitions or changes from warmth to cold, while the vegetation is ſtrong. The action of cold, in either of theſe caſes, cauſes coaggulations or analizations of the ſap in the extreme parts of the plant, that are replete with ſucculence; or quick repulſions of it from thoſe parts, which conſiſt almoſt wholly of ſucculence, impelled there by the action of preceding warmth, before the fibrous organization is duly matured to bear ſuch privation of the ſap without deſtruction. In either of theſe caſes partial mortification happens; the ſap is depraved; and the vital power of the plant weakened in proportion: whence the vegetable œconomy of the plant being perverted, the ſeveral conſequences above enumerated are neceſſarily brought on.

But there is another conſequence, reſulting from this ſtate of the plant, which acts as a ſecondary cauſe, not leſs momentous in its effects than the primary. This is the tendency of the weakneſs of the plant to generate animalculæ. There is nothing ſo clear from obſervation, as that this tendency is always concomitant with the weakneſs of vegetables. It will be conſtantly found, on examination, that where-ever any part of a vegetable falls into a languid ſtate, ani-

animalculæ are generated in it; and infeſt the plant, till it either die, or recover its health by the ſeparation of the part, on the principle of mortification. In the *ruggine*, therefore, this ſecondary cauſe brings on ſecondary diſeaſes, with their reſpective ſymptoms: ſuch as bliſtering of, or inequalities in, the exterior ſurface of the coats; the powdery appearance on it; and the waſte of particular parts, by a ſeeming annihilation, without any apparent reaſon.

This ſecondary diſeaſe not only propagates itſelf from one part of the plant to another; but even ſometimes to the contiguous plants. It is, alſo, in many caſes, the occaſion of the deſtruction of plants; which would, otherwiſe, ſurvive the proper and neceſſary effects of the firſt cauſe; and, by throwing off the particular parts, where the mortification had prevailed, regain their priſtine health, vigour, and fertility.

The injury done to corn by the ſeverity or irregularity of ſeaſon, particularly ſudden changes from warmth to cold, is, therefore, the efficient cauſe of the *ruggine* or *blaſting*: but there is alſo a prediſpoſing cauſe which greatly contributes to the effects of this. It is, a preceding weak or languid ſtate of the plants, induced by any accidental circumſtance. Such as want of due acceſs of air: too much ſhade; an exceſs of any drineſs, or moiſture in the

the ground; or wharever may affect the health or vigour of the plant. For the motion of the ſap being languid, the vegetative fermentation is proportionably weak; and, therefore, ſooner checked or totally deſtroyed by the cold; and the coaggulation, or ſtagnation of the juices in the extremities produced.

As the principal or effective cauſe of blaſting, lies in the accidents of ſeaſon, it cannot be the object of curative intention. But the prediſpoſing cauſe, that is the weak ſtate of the plants, which is in a great degree neceſſary to the action of the other, does admit of preventive means; and may, in ſome meaſure, be counteracted by art.

The Count has enumerated the various remedies propoſed by the writers againſt the *ruggine*, or blaſting of corn. But the greateſt part of them appear, on the firſt view, to be trivial, or impracticable. The moſt common among thoſe, which can be of any utility, is the ſoaking the ſeed in certain compoſitions, or ſolutions of ſalts. But it is very dubious, whether this can have any relation to the prevention of the blaſting itſelf; though it may, as we ſhall ſee below, have ſome efficacy againſt the conſequences of it, as far as they regard the breeding of animanculæ.— In the account of the remedies for this diſeaſe, to which the Count aſcribes any efficacy, he firſt mentions the making drains to carry off ſtagnating waters: which, from inſtances

inſtances, he cites, contribute much to diſpoſe corn growing near them to blaſting. This notion is obviouſly juſt: as the vapours of putrid waters are noxious to many vegetables, as well as animals: and, whatever impairs the health of the plants, renders them, on the principle above ſpecified, ſubject to be eaſily blaſted. He mentions, alſo, the anointing the ears of the corn with oil, as being efficacious againſt this diſeaſe. But, however it may have appeared ſo in ſpeculative, experiments, nothing is more evident than, that it never can, on account of the expence and labour, of the performance, be reducible to practice in huſbandry.—He recommends, with much greater reaſon, as an approvable means for preventing this diſeaſe, to keep the corn free from all weeds, and other ſtrange plants: and to looſen the ground at the roots of it. This, he ſays, conduces ſo much to the preſerving it from the *ruggine*, that, on practiſing it in ſeveral different places, he never found any corn blaſted there; though it has been, at the ſame time, attacked by the *carbone*, or *ghiattone*: that is, *ſmut* and *mildew*.

It may be added, to what the Count has advanced, as to the remedies againſt the blaſting of corn, that every thing, which contributes to the vigour of the plants, without cauſing a too great luxuriance in their growth early in the ſeaſon, will be found beneficial in preventing it; and counteracting its de-

ſtructive conſequences.—A good tilth of the ground, previous to the ſowing, is the moſt effectual of all other means. The ſtirring the ground at the roots, at proper times, is, alſo, very efficacious. The drill method of culture affords, at the ſame time, the means; and gives ſpace, as well as liberty from the conſiſtence of the ſoil, which greatly promotes the vigour of the plants.—It muſt be further obſerved, likewiſe, that where too great luxuriance of growth early in the ſpring threatens, to make the plants too tender to bear the rigour of keen blaſts of wind, the eating it down, or the depreſſure of the too quickly aſpiring blades, by the uſe of the roller, have, alſo, a very beneficial effect againſt the *ruggine* or blaſting; as may be deduced from the principles above explained.—It is, indeed, as before intimated, a preventive means only, with regard to the prediſpoſing ſtate, that can be employed againſt the original, or primary diſeaſe of blaſting; which has its cauſe in the accidents of the ſeaſon, that affect the growing corn according to the ſtate in which it ſuffers the attack. The ſecondary diſeaſe, or thoſe conſequences, that happen from the generation, and propagation of ſmall animals, when the plants are thus injured in particular parts, or have their whole conſtitution depraved, will be beſt mitigated by the means, we ſhall hereafter point out, in treating of the other

other diſeaſes of corn, which conſiſt only in the plant's being infected by *animalculæ*.

The *ſecond* of the capital diſeaſes of growing corn, treated of in his work by the Count Ginanni, is called by him LA FILIGINE DEL GRANO. It correſponds, according to his deſcription of it, with one kind of thoſe morbid affections, that are generally called with us the *ſmutting* of *corn*. For, unfortunately, we give the ſame appellation of ſmut, alſo, to another diſeaſe very different in its appearances from this: and which he juſtly ranks as a different diſeaſe, and treats of by the name of *Il Grano Carbone*. But though theſe two are not commonly diſtinguiſhed with us, by different names; yet the moſt ſagacious of the modern farmers, nevertheleſs, have obſerved them to be different. From Mr. Reynolds's account of ſmut, given in Article IX. of this Volume, it further appears, that, in the part of Kent where he lives, the *carbone* is called *bag-ſmut*: and he has given the name of *looſe-ſmut* to the *filigine*, or kind, we are now treating of. I ſhall, therefore, adopt thoſe names here: and, to preſerve conformity, call the *filigine*, LOOSE-SMUT: and the *carbone*, being already termed bag-ſmut in ſome places, I ſhall retain that appellation for it.

The Count declares, the looſe ſmut to be, according to his opinion, an internal diſeaſe of corn; and deſcribes it with accuracy. He ſays, that

it attacks the ear only, moſt generally in its earlieſt ſtate, before the grains are diſtinctly formed; and while it is yet incloſed in ſeveral *involucra* or coverings, conſtituted of *folliculi*, or very thin coats of a ſoft tender ſubſtance; which afterwards grow thicker and ſtronger; being deſigned to ſecure the young ear with the rudiments of the grains from internal violence. The rudiments of the grain, in conſequence of the effects of this diſeaſe become wholly, or in part, corrupted and blackiſh: and, when the ear is grown bigger, and come out of the *involucrum*, which incloſed it while young, the corrupted matter becomes ſolid; and ſo dry as to reſolve itſelf into a fine impalpable powder of a fetid ſmell, that flies away with the wind, or any other motion. The ſtem of the ear is then left bare, whole, ſound; and, ſometimes, green, juicy, and plump. Before this happens, the appearance is an irregular formation of the top of the ſtalk, or ſtraw, which ſeems to grow gradually thicker, and ſhews the young unformed ear, for the moſt part wholly of a black colour; intermixed with white follicules, ſo looſe, that, with the leaſt rain, wind, or any other motion, they are carried off, together with the blackiſh powder, which they ſupported. It is proper to obſerve, however, that the *filigine*, or looſe ſmut, is rather of a very dark cheſnut colour than black: and the nearer it is found towards

wards the bottom of the ear, the more it appears diſcoloured. It is alſo, ſometimes of an aſh colour; and like that of a decayed olive.

The deſcription given, by the Count Ginanni, of the *filigine* agrees perfectly with what Mr. Reynolds has remarked of the looſe mut: who ſays, that this powerful "enemy never fails to make its appear-"ance in the field, when the grain is "coming into bloom; and is ſeen at no "other ſeaſon but when the corn is ge-"nerating:—We may behold, at this time, "the habitations of theſe animalculæ *(for he "aſcribes the whole effect to animalculæ)* "broken down, and ſhattered all to pieces; "their proviſions gone; and the whole ear "devoured; nothing being left but the "black duſky particles, intermixt with the "eggs, and progeny of ſuch inſects, as "brought on the cauſe: the product or ſub-"ſtance of this ſmut being blown away, little "or none of it comes into the barn to affect "the grain with blackneſs: as the other or "bag-ſmut does." It is evident from hence, and from what we ſhall below obſerve of the Count's deſcription of the *carbone*, that the diſtinction of the looſe-ſmut, and bag-ſmut, as noted by Mr. Reynolds, correſponds entirely with that of the *filigine* and *carbone*.

In treating of the *filigine* or looſe-ſmut, the Count Ginanni mentions the opinions of various authors. Theſe opinions, neverthe-

leſs, are only ſo many hypotheſes formed on notions of the vegetable œconomy, reſpecting the nature of the ſap, and its motion; or the conſtruction and action of the ſolid parts of the herb: and they, by no means, agree with the facts and principles, which the later more accurate obſervations have eſtabliſhed ſince the improvement of phyſiological knowledge. He leaves the original cauſe of this diſeaſe, therefore, unexplained; and only attempts to ſhew, by the appearances he deſcribes, the progreſs of its effects on the herb and grain.

It is extraordinary, that the Count ſhould not have taken under conſideration, how far there may be ground to believe this diſeaſe has its origin in animalculæ. But he is wholly ſilent as to that point: though it is evident, that the *filigine* is contagious; and that the contagion, reſiding in the grain, communicates its effects to the plants produced by other grain which have come in contact with ſuch as are infected. This ſuggeſts the generation of animalculæ to be the means of ſuch contagious communication; though it has not been hitherto actually obſerved: and there are other circumſtances in the appearance of this diſeaſe, which ſupport his opinion.

Though the Count has wholly overlooked *animalculæ*, as a preſumptive cauſe of the *filigine*, Mr. Reynolds, in his account of the ſmutting

ſmutting of corn has pronounced boldly, from the manner in which the appearances of it ſtrike his imagination, that animalculæ only are the cauſe of both kinds of it, without entering more deeply into the diſquiſition of the arguments for or againſt ſuch an opinion. Among the reaſons for inclining to the belief, that animalculæ are the cauſe of both kinds of ſmut, there is one of very great weight. —The looſe-ſmut, as well as the bag-ſmut, affords a conſiderable quantity of volatile alcaline ſalt on diſtillation; which the Count himſelf mentions in another caſe to be a proof of the preſence of animal ſubſtance. It may, indeed, be objected to the inference, I would draw hence, that ſome plants do, in their diſtillation, afford volatile ſalt from their own proper ſubſtance when not diſeaſed. But this, by no means, holds good of ſuch plants as yield fixt alcaline ſalt on their incineration: amongſt which muſt be ranked corn while ſound. It is evident, conſequently, there is ſome additional matter to the proper ſubſtance of the grain, which produces the volatile ſalt; and that muſt be preſumed to be, either animalculæ themſelves; or their ova or excrements. The production of volatile ſalt in the diſtillation of ſmutted corn is, indeed, almoſt as great a proof of the preſence of animalculæ, as the actually ſeeing them would be: ſince no change in the natural parts of

the plant while growing, would bring on the property of affording ſuch ſalts, according to the known laws of chemiſtry.

The aſſigning the cauſe of the *filigine*, or looſe-ſmut to the animalculæ generated in the rudiments of the grain, and deſtroying the tender parts of it is, therefore, well juſtified. For neither mechanical defects in the conſtruction of the parts of the plant, preventing a due tranſpiration, or cauſing morbid ferments, from both which the cauſe is attempted to be explained by ſome; nor the accidents of ſeaſon, to which others impute it, can poſſibly account for the contagion, or the production of the volatile alkaline ſalt: which, on the other hand, are very ſatisfactorily ſolved by the ſuppoſition of the animalculæ; that would of courſe produce both theſe conſequences, and the other effects of the ſmut in corn.

In treating of the remedy againſt the *filigine* or looſe-ſmut, the Count Ginanni determines almoſt as little, as he does with reſpect to the cauſe. He ſpeaks of the ſprinkling the blade, while young, with ſpirit of ſal ammoniac, and mixtures of ſimilar ſaline bodies: but he juſtly condemns it in practice. He recommends nothing, but the ſowing all the grains of corn at a diſtance from each other; keeping the ground clear of weeds; and avoiding the ploughing ſome lands in time of bad winds.

The

The ſowing the grains at a diſtance from each other, the firſt of the remedies enumerated, will certainly contribute to the vigour of the plants; and ſo will the keeping them free from weeds. But it is not practicable, in large culture, either in the drill or broad-caſt methods of ſowing, to prevent unequal diſtances in the grain ſown: nor, indeed, can any means effect the placing the grains at equal diſtances but the ſetting them ſeparately with the hand. In ſowing either by the hand or drill-plow: it is impoſſible to obtain a regularity of diſtance in the grains to each other; and though, by a great diminution in the quantity of ſeed ſown, there would be neceſſarily more ſpace between the plants in general; yet the reducing it to leſs than a certain proportion, with regard to the fertility of the ſoil, would occaſion an intollerable defect in the crop. This remedy, therefore, cannot be applied in practice; though it may appear to avail in experiment, where the grains may be ſet with exactneſs at any deſired diſtance.

The keeping the ground clear of weeds, the next remedy againſt the looſe-ſmut, propoſed by the Count, is certainly one means of leſſening the ſmut; as whatever weakens the plants has a tendency to promote the bad effects of it. But it is only a mitigative remedy. For, if the cauſes of ſmut, and the other circumſtances that tend

to encourage it, ſubſiſt any-where, the clearing away the weeds, will, by no means, be ſufficient to prevent its being very prevalent.

The avoiding to plough lands of a certain quality, during the time of pernicious winds, is the laſt remedy, mentioned by the Count, as efficacious againſt the *filigine* or looſe-ſmut. The antients, he ſays, paid great regard to this caution, and with adeqate reaſon. If there be, nevertheleſs, any real ground for the notion, that plowing the ground, while the wind is in a particular quarter, can be of any effect in producing diſeaſes of corn afterwards ſown in ſuch ground, it muſt ariſe from a local cauſe; and, moreover, cannot extend to the looſe-ſmut.

The known principles of phyſics do not lead us to believe, that the air itſelf, in whatever direction its motion may be put, can impregnate the earth with any quality injurious to vegetables: and experience has ſhewn, alſo, that land, inſtead of being depraved, is improved in its fertility by expoſure to the air. It muſt, therefore, if the fact be true, that particular winds do impart qualities to the earth, which contribute to the diſeaſes of corn, be owing to their conveying, from one place to another, ſome peculiar matter capable of producing ſuch effect: and this matter not being general to the

the air, can be taken up, by it, only in thoſe places where it abounds. Particular winds, therefore, only affect particular places aptly ſituated, with reſpect to ſome others from whence the noxious effluvia are brought by ſuch winds: and, conſequently, this action of winds muſt be local and confined to thoſe places. — But if we conſider of what nature the effluvia are, which may be thus conveyed by winds, from one place to another, and impregnate the earth with qualities injurious to the health of plants, we ſhall find it can be only animalculæ of the fly kind: which, being generated in a more abundant manner in particular places, may be carried by winds to others; and there, diſperſing their ova in the ground, fill it with their breed in ſuch a degree, as would not happen, if they had not been thus conveyed thither by ſuch winds. —Hence, in the enſuing ſeaſon, the grain may ſuffer greatly in the herb, from theſe animalculæ, while in their chryſalite ſtate. —The places where great numbers of ſuch animalculæ are produced are marſhes, bogs, and grounds lying contiguous to ſtagnated waters: which keep up continued breeds of ſuch ſmall animals; that only migrate through accident into other places.

But this principle does not reach the production or augmentation of ſmut in corn: which, tho' probably animalcular, is a ſpecies different in its œconomy from the kinds thus

generated in, or near, ſtagnant waters. Experience, likewiſe, with us, gives no room for imputing the introduction, or increaſe of ſmut, to ſuch a cauſe: and, if the antients had any foundation for their notion, that ploughing during particular winds, induced qualities in the ſoil pernicious to corn, it muſt be bringing other diſeaſes on it, which they confounded with ſmut; and not the ſmut itſelf.

In a note, the Count mentions, as an opinion of others, that macerating the ſeed-corn in lime-water is a preventive remedy againſt the *filigine* or looſe-ſmut. But he declares it to be his own opinion, founded on ſome trials where this method did not appear to ſucceed, that it is not of any avail againſt that ſpecies of ſmut: though he deems it efficacious againſt the *carbone* or bag-ſmut. A much larger field of experience, and obſervation with us, ſhews, nevertheleſs, that the Count erred in this matter, by making concluſions from too ſlender premiſes; and that lime-water is very ſerviceable againſt both kinds of ſmut. Indeed, if we impute both kinds of this diſeaſe to animalculæ, the reaſon, *à priori*, why lime-water ſhould be efficacious againſt both, is very evident: which is, that the cauſe of its action lies in its cauſtic power, by which it deſtroys the minute animals, or their *ova*.

The maceration of corn in a ſolution of ſea-ſalt, which is commonly called BRINING, is a ſtill more efficacious palliative of the looſe ſmut than the uſe of lime-water: though it is wholly omitted by the Count. How far the brine acts on the corn, in deſtroying what produces the ſmut, is a point not hitherto very clear. But it is certain, that it affords the means of ſeparating the light grains from the ſound; and among the light grains, are thoſe, which are contaminated by the infectious matter of the ſmut to a certain degree, without being ſo injured as wholly to loſe their vegetative power: and which conſequently are the medium whereby this diſeaſe is propagtaed among the growing plants. It is now known, that the liming and brining may be performed with advantage under one operation. But of the effects, and beſt method of practiſing the brining, either ſingly or with lime, we ſhall have occaſion to ſpeak more at large in ſpeaking of the next of the diſeaſes, the Count has enumerated.

The THIRD of the capital diſeaſes of growing corn, treated of by the Count Ginanni, is called, by him, IL GRANO CARBONE. It anſwers, as before-mentioned, to the kind of ſmut, named, in ſome places with us the *bag-ſmut*. He ſays it is "an internal "depravity of the grain, of a moſt deſtruc-"tive nature, which conſtitutes that diſeaſe,

"ſeen,

" ſeen in the whole, or part of the grain of " the ear, at the time when the ear is en- " cloſed in its pannicle; and the grains are " intirely and ſtrictly covered with their " *folliculi:* and which makes the grains " deviate from their natural form and be- " come of twice the uſual length, and with- " out a point; renders their ſkin, or coat, " very ſmooth, and eaſily yielding under the " teeth; makes them thicker than ordinary, " and full of a fluid matter of a black tinge, " extremely fetid; which, growing dry, " reſolves itſelf, by degrees, into a powder, " while the hard ſkin, or coat, becomes eaſy " to be broken by the ends of the fingers, " or cracked by the leaſt preſſure." It may be added to this, that theſe grains, breaking among the ſound grains, when the corn is threſhed, give them a black hue on the outſide.

This diſeaſe is, without doubt, ſpecifically different from the other ſpecies of ſmut, called the *filigine*, or looſe ſmut. For, though the Count ſeems inclined to think, it is only a variety, or perhaps, a different degree of the ſame, he himſelf produces facts, that ſhow it really and abſolutely of another kind. The principal of theſe facts is, that there are places where, though the *filigine* can be proved to have been for many ages paſt, yet the *carbone* was never known till of late years. This evinces, that theſe diſeaſes are not a difference

ference in degree of one only: becauſe the accidents, which may have been ſuppoſed to have aggravated the *filigine* into the *carbone*, muſt have happened formerly as well as lately in ſo long a courſe of time, as corn muſt have been cultivated in the places where it was not before found.—The ſame may be, likewiſe, ſaid, as to its being a variety, ariſing out of the other kind. For it could ſcarcely have been produced in ſo many other places, and not have emerged here, in ſo great a length of time.—It is the tranſportation of a new contagion to theſe places, by bringing ſome infected corn from elſewhere, that alone can naturally, and clearly account for the introduction of the *carbone:* and this, making the caſe not to depend either on local circumſtances with reſpect to any peculiarities of the ſoil or wind, nor on general properties in the herb itſelf, will lead us to infer more ſtrongly ſuch cauſe to be really that, to which, for other reaſons alſo, we ſhall aſcribe it below.

In treating of the cauſe of the *carbone*, or bag-ſmut, the Count Ginanni aſcribes it to "an organical defect, which conſiſts in a leſs "perfect and naturally weak texture of the "fibres of the germs of the ſeed itſelf."—He ſees, however, the difficulty, that reſults from the not finding the effects of this cauſe more conſtant as to time and place: and he ſays that by a good conſtitution of the air, regular

regular and kindly winds, and exterior aid, this weak power of the fibres may be counteracted; and that they may be ſtrengthened, ſo as to admit of the corn's attaining to perfect maturity.—He, likewiſe, labours to account mechanically for the manner, in which the weakneſs of the fibres produces the appearances found in grain affected with this diſeaſe: and he endeavours to illuſtrate his hypotheſis, by ſimilar effects of weakneſs in other parts of plants.

But, after all, the Count's notion of the cauſe of this diſeaſe is merely conjectural, according to his own arguments; and evidently erroneous, conſidered with relation to other facts, and known principles, which he does not bring in queſtion: as every ſuppoſition, that does not ſquare with eſtabliſhed truths, muſt be deemed repugnant to reaſon.

That the *carbone*, or bag-ſmut, is contagious is evident, from the moſt extenſive obſervation. Many places are known to have been free from it, till it was carried to them by infected grain: and it is well known, that ſuch grain mixt or ſown with ſound corn, will ſeldom fail to propagate the diſeaſe to it. Theſe effects can never be accounted for by mechanical defects in the rudiments, or the bad ſtructure of the germs of the diſeaſed grain: the conſequences of which would be confined to them; and could not be imparted to others, and propagated in

ſucceſſion. There is, moreover, another fact, ſaid on good authority to be eſtabliſhed by obſervation, which raiſes equal difficulties to his opinion. It is, that, if a quantity of this kind of ſmutty corn be divided into two parts; and the one ſown the next ſeaſon after it is reaped, and the other kept to the third year, and ſown then, ſuch part as was ſown while freſh will produce ſmutted corn in the crop; and the other ſound corn, wholly free from ſmut. It is obvious, therefore, that this diſeaſe generates ſome contagious matter, which propagates it: and, conſequently, it cannot have its original in the male-formation of the parts of the affected grain.

Though the Count has adopted the hypotheſis of a mechanical cauſe of this diſeaſe in grain, as his own opinion, yet, in ſpeaking of thoſe of others, he mentions the notion of its being cauſed by animalculæ. If we conſider the circumſtances, above-mentioned, of the conveyance of this diſeaſe by infected grain to places where it did not ſubſiſt before, and the propagation of it thence through the adjacent parts;—reflect, likewiſe, in how many inſtances, indeed, all where we have the means of due examination, the contagious diſeaſes of the vegetables is known to be owing to animals;—and admit the force of analogy; — we ſhall ſee the juſteſt reaſon for allowing animalculæ to be the cauſe of bag-

ſmut;

ſmut: nor can we find any other principle that is in the leaſt apt or adequate.

Mr. Reynolds, in one of his letters contained in *Article IX.* of this volume, without heſitation, aſſerts both the kinds of ſmut to ariſe from *animalculæ*. He ſays, page 135, "And I dare pronounce, that both theſe diſ-"orders proceed from a like cauſe, which is "the infection of inſects, or ſome kind of "ſmall animals, ſuch as the learned call "animalcules; generated in the plants, and "from no other cauſe whatever." In page 137, he further ſays, ſpeaking of the *carbone*, or bag-ſmut: "The other incruſted, "enemy, or bag-ſmut brood, act, indeed, "more privately; and occaſion the greateſt "diſorders among wheat when it comes to "maturity. Becauſe it renders it odious; "and ſometimes totally unfit for bread. "Theſe vermin, ſtick on the outward coats, "for wheat has two coats, during their "abode in the corn: eſpecially after threſh-"ing: when the bags are broken; and the "grain becomes mixed. Their exiſtence is, "however, but of ſhort duration; for un-"leſs the grain be committed to the earth "in due time, they certainly periſh. Be-"cauſe we find, from well-grounded expe-"rience, that old ſeed ſown in its natural "ſtate is free from ſmut in the next gene-"ration: as numbers can witneſs. And

"we

" we have recent inſtances to confirm this, " even in the laſt year. For none of the fo- " reign wheat, that was one, two, or thre " years old, ſown in theſe parts had any ſuch " diſorder. — But with new ſeed the caſe is " manifeſtly different. The enemy ſtands " at the door of vegetation; paſſes along " when it is open; unites afterwards, as the " plant advances, with the floury ſub- " ſtance deſigned for food; and, in the end, " devours that matter, which would other- " wiſe become flour in the grains: leaving, " inſtead of it, a noxious black powder in- " feſted with the eggs, brood, and excre- " ment of the inſects. Hence comes the of- " fenſive ſmell.—This accounts for the diſ- " eaſe; and ſhews us pretty plainly, that it " proceeds from inſects, and vermin, &c. " only."

We may, therefore, advance on very ſafe grounds, that, if we cannot prove, by the evidence of the ſenſes, the bag-ſmut is cauſed by animalculæ, we may conclude it from the effects, and from analogy: and the rather, as there is another diſeaſe of a ſimilar kind, in which the cyſt, or cavity in the corn, containing the ſmutty matter, is much more ſtrongly defended by the coat; but being broken open, and the contents macerated in water, very ſtrong active animalculæ are brought to life, or revived, even though the corn has been kept for twenty years.

In treating of the remedies for the *carbone*, or bag-ſmut, the Count Ginanni is very conciſe, though he enumerates five different means.

The *firſt* means of cure he propoſes is of the preventive kind; and conſiſts in the breaking and ſtirring the ground well before the ſowing the grain: and which, he ſays, will bring forth that ſpirit, which ſtrengthens the fibres of the ſeed; and enables them to make reſiſtance, and defend themſelves againſt it.

As a *ſecond* means, he declares, that the uſe of ſtable-litter, or dung, will much contribute to promote the foregoing intention by furniſhing a copious quantity of the ſpirit, which invigorates the plant.

This is, in fact, only recommending tillage and manure, which giving ſtrength to the plants, and producing a vigorous ſtate of them, will, it is well known, render them leſs ſubject to the attacks of any diſeaſe. But this ſpecies of remedy will, of courſe, be employed by every farmer, for other obvious reaſons; and, therefore, needs but little recommendation to enforce its practice on this account.

In the uſe of manure, where there is danger of ſmut from other circumſtances, care ſhould be taken in the choice of it. For nothing has been found to contribute more to the increaſe of ſmut than the uſe of freſh ſtable-

ſtable-dung, and litter, when laid on the ground in a mouldy ſtate, without ſufficient previous rotting.

The Count admits, however, that this kind of remedy is only palliative: and that it does not wholly prevent, or deſtroy ſmut. He, therefore, proceeds, to the following: which are, ſuch as are ſaid to be more abſolutely effectual.

The *third* means, he mentions, is the ſoaking of the ſeed in lime-water: which, he declares, he has found of ſome ſervice; but not a certain and abſolute remedy againſt this ſpecies of ſmut.

The uſe of lime is now become very general, from the experience of its being conſiderably efficacious againſt ſmut: and it is much practiſed now, alſo, to *brine* the ſeed, as is called, before the ſowing. This is, the ſoaking the ſeed in water, to which ſea-ſalt has been added. When brining is practiſed, it is common now to mix ſome lime with the ſeed.

There are various other ingredients, and compoſitions; ſuch as ſolutions of nitre, ſal ammoniac, and vitriol; urine; ley of aſhes; mixture of horſe-dung and water; uſed for this purpoſe, both in Italy and elſewhere, as the Count obſerves in his notes. Theſe are called *ſalamoje*; and the greateſt part have been tried, and exploded in moſt countries, where improvements in agriculture have been attempted. The uſe of a ſolution of

ſea-ſalt ſimply, with us called *brining the corn*, and of lime, has, however, from univerſal obſervation, been found of great utility; and, therefore, merits conſideration, as a remedy for the ſmut: though, perhaps, we have not hitherto ſufficient authority for believing, that it is infallible in any mode of practice of it.—Mr. Reynolds, nevertheleſs, gives us encouragement to hope it may be ſo. In the method, he has communicated to the Society for the encouragement of arts, &c. which is contained in *Article IX. of this volume*, he has joined the uſe of lime and ſea-ſalt in one operation: and he ſays, that it has always ſucceeded with him for thirty years together, in a great variety of ſoils, and on large quantities of land.

That lime deſtroys ſmut, or in ſome manner counteracts the effects of it, is certain. But it has been doubted by ſome, whether brining has any conſequence in that view, beſides the giving an opportunity for the ſeparation of the grains, that are infected in a more conſiderable degree with any diſeaſe, from the ſound: which becomes practicable from the increaſed ſpecific gravity of the fluid, that renders ſuch grains, lighter than the ſound corn, more buoyant, and diſpoſed to float on the ſurface: whence they may conſequently be ſkimmed off. It is highly probable, nevertheleſs, that the maceration, or ſoaking of the corn in ſalt and water, has

ſome

ſome other operation in preventing ſmut: which may be, in aiding the due vegetation of the plant; that would, otherwiſe, be imperfect from the injured ſtate of the ſeed. There is reaſon to conclude, that the ſalt imbibed may prevent the rotting of the coats of the ſeed before the proper change be made in the farinous part, for promoting the vegetative efforts of the planticula, or ſeed germ, by checking the fermentation, that cauſes theſe efforts, in changing the *farina* into ſaccharine juice: which is probably too rapid in the grains injured by diſeaſe, where the fibres that contain the *farina* are broken or corroded.—It is probable, that lime acts in the ſame way, in preventing ſmut, by checking, the too quick fermentation in the ſeed; as well as by deſtroying the *ova* or brood of *animalculæ*: ſuppoſing the cauſe of the diſeaſe to conſiſt in them.——Mr. Reynolds's method of joining the liming, and brining in one operation, has ſome peculiar conveniencies, which are pointed out in the notes, *page* 131 and 132, *of this volume*. But whether ſo ſmall a quantity of lime, as is abſorbed in the ſoaking in lime-water, is equally effectual with that quantity which is buried with the ſeed, when the dry lime is uſed in a ſolid ſtate, ſeems to be an undecided queſtion. Mr. Reynolds' aſſurance, that this method never failed in a great number of years and very

extenſive application, is a greater authority than has been advanced, or, perhaps with truth, can be advanced of any other method. It is, moreover, eaſy in practice for any purpoſe: and particularly accommodated to the drill method.

The *fourth* means enumerated by the Count, and from which he aſſerts he has found equal advantages to thoſe already mentioned, is, the infuſing the grain in the waſhings of the marc, or preſſings of grapes, made pretty hot; or in the *feces* of oil well diſſolved in the lixivium uſed for ſoaking the olives. This practice is not ſo ſuitable here, where wine is rarely made from grapes; and oil never from olives. The operation of theſe ſubſtances, as a remedy for ſmut, is probably the ſame with that of the lime and ſea-ſalt: and there is not the leaſt reaſon to believe, they are more efficacious. It is not, therefore, a matter of any regret, that we have not the opportunity of employing them.

The *fifth* means the Count ſpeaks of; and which, he ſays, he has, perhaps, found the moſt efficacious of any; is to ſprinkle the powder of ſulphur, with us called flour of brimſtone, over the ſeed-corn; and to mix, and ſhake them, ſeveral times, together. He adds, This method has been attended with ſuch ſucceſs, that, in his trials, ſince his uſe of it, he has never ſeen the grain, produced

in

in the fields where he makes his experiments, attacked with this diſeaſe.

There is great reaſon to believe, that ſulphur may act on the grain, and the contagion of the ſmut, in the ſame way, as lime or common ſalt; and probably with greater power. The uſe of it is commodiouſly practicable; attended with very ſmall expence; and requires leſs time than brining. It were, therefore, to be wiſhed, that further experiments were made on this method: as, if found effectual, there are caſes where it would be found more convenient than brining, and lime. And there is great reaſon to believe, that ſulphur might preſerve the ſeed from the attacks of other ſmall animals, as well as the ſmut.

The *ſixth*, and laſt means of remedy againſt the *carbone*, or bag-ſmut, recommended by the Count, is, the plucking out, and taking away all the ſmutted ears, while the corn is growing: which, of courſe, prevents their damaging the grain of the ſound ears after the reaping. This, he ſays, is eaſily practicable, by the farmers, and their ſervants, by going over the fields when the grain is near ripe, at which time, the diſeaſe ſhews itſelf very conſpicuouſly. It is certainly one way of preventing the miſchief of the ſmut: but, however eaſy it may be in the Count's country, or other places where farmers have only ſmall quantities of corn, and plenty

of hands, it could not be made to anſwer here in large tracts of corn-land; and where labour is dear. This method would be, conſequently, a bad ſubſtitute for ſome of the foregoing: which, if duly practiſed, would prevent in a great degree the occaſion for it, with a very ſmall part of the expence and trouble.

On the whole, therefore, the uſe of brining and liming in the broad-caſt tillage, and of Mr. Reynolds' method in the drill-culture, are thoſe, which experience has hitherto ſhewn to be moſt efficacious and certain. The uſe of ſulphur, ſhould further experiments confirm what the Count's trials have offered to his obſervation, would, perhaps, be preferable to thoſe methods: but a much greater baſis of experience than is yet diſplayed to the public on this point, is neceſſary, in order to give a juſt ground for ſuch a determination.

The *fourth*, and laſt of the principal diſeaſes of corn, treated of by the Count Ginanni, is called by him IL GRANO GHIOTTONE: by which name is meant that manner of corn's being affected, that is named, with us, the MILDEW.

The Count deſcribes the *grano ghiottone* to be an internal diſeaſe, which changes the figure of the grain, as ſoon as the ear comes out of its *involucrum*, or covering; makes it grow more than ordinarily, but yet unequal-

ly,

ly, round; and renders it of a greeniſh hue, till it become dry; when it acquires a duſky lion colour; has a rough coat; and is eaſy to be broken by the teeth. The grains being then, likewiſe, of various ſizes: but always leſs than corn while green: ſome being only of the bigneſs of black pepper; and others of laurel, bay, ivy, or juniper-berries: and theſe grains do not contain any farinous ſubſtance; but have within them a fibrous matter, exceedingly white, of a pliable conſiſtence, very eaſy to be broken, and reſembling talc in appearance; which fills the cavity of the *matrix* of the grain formed by the incloſing membranes.

Our countryman Needham ſays, "the mil-"dew is a diſeaſe of corn, that deſtroys "the farinous ſubſtance within it; and in-"troduces a foreign matter; which diſco-"lours and blackens the grain, at leaſt exter-"nally. This matter is either a powder, "black and very fine, but of which the parts "viewed in a microſcope, have not any uni-"form figure; or a white ſubſtance entire-"ly compoſed of long fibres packed toge-"ther; and which do not give any ſign of "life or motion if they be ſubjected to the "microſcope, as they are taken out of the "grain, without applying any moiſture to "them." It is evident here, that Needham confounded the *carbone* or bag-ſmut, with the mildew; and ſuppoſed the ſame diſeaſe

diſeaſe produced the black powder, and the white fibres: though, if he had attended carefully to the appearances in the grain affording each of theſe ſubſtances, as to their magnitude, form, and other particulars, he would have perceived a conſtant difference; and, of courſe, concluded them to ariſe from a different cauſe. The Count has been more accurate; and rightly diſtinguiſhed them. He has ſeparated the real changes, reſulting from the cauſe of the *ghiottone*, from the others owing to different cauſes: and which are, nevertheleſs, both, by common obſervers, and even ſome of the beſt of our writers, aſcribed to the mildew.

With reſpect to the cauſe of the *ghiottone*, the Count declares himſelf ignorant of the time when the corn is firſt affected by it: and he ſays, it would be a chimerical purſuit to ſeek the diſcovery of it. Some accurate and ſagacious obſervers with us have, however, ſuppoſed it to be when the corn is in flower: and, as it is very probable, that the injury done to the *farina fecundans* is the cauſe of this barrenneſs, and other changes in the grain, which are found to be the conſequences of this diſeaſe, we may reaſonably allow ſuch a conjecture to have ſome foundation.

As to the nature of the cauſe of the *ghiottone*, the Count determines nothing: but he declares, that he thinks it a rational hypotheſis, to impute it to animalculæ. He even takes

takes great pains to prove philoſophically, that it may be ſo, by removing the difficulties which might be brought, with relation to the animal œconomy, againſt this ſuppoſition, on account of the extraordinary circumſtances under which theſe animalculæ muſt ſubſiſt before the herb attains a more advanced ſtate of vegetation. But this ſeems needleſs. For, though nature appears to obſerve analogical laws in general, as to the ſtructure and vital œconomy of animals; yet it is with almoſt infinite variety and latitude: and they are generated, and live in ſituations, that break in upon general rules almoſt to the degree of a direct oppoſition. Such are thoſe animals, even of very conſiderable magnitude, that are found in the livers of various diſeaſed beaſts; the worms which grow to an exceeding great length betwixt the muſcles of men; and many others.

But the difficulty the Count labours thus to remove, on the ſcore of the ſtate of the animalculæ in the corn, before they ſhew themſelves by their effects, has poſſibly no exiſtence in fact. That the *ghiottone*, or mildew, does proceed from the injury done to growing corn from animalculæ, there is very little reaſon to doubt. But it may well be queſtioned, whether thoſe animalculæ, have their ſeat in the grain itſelf; or, as he ſuppoſes, ſome other part of the plant, by the miſchief done to which, the

the grain may be ſecondarily affected. I have above mentioned, that the cauſe, of this diſeaſe, as far can be collected from appearances, ſeem to act firſt about the time of the flowering of the herb; and that it is not improbable, the change produced in the grain, may be owing to the deſtruction of the *farina fecundans*, which ſhould impregnate it, and produce its perfect ſtate.

There will be the more reaſon to incline to this hypotheſis, if we obſerve, that, about the ſame time, the external effects of the mildew ſhew themſelves in other parts of the plant; and with ſuch a ſtrong and quick change in them, as is much more conſiſtent with a general external cauſe, acting on the exterior parts of the plant, than an internal one. This, indeed, is ſo evident, particularly in the exudation, that vulgar obſervers aſcribed it, as they are apt to do, the manna and all other appearances of that kind, to ſomething which falls from the atmoſphere on the plant. If we, therefore, impute the effects to inſects attacking the exterior parts of the plant, the flower would, in common with them, be expoſed to the miſchief: and the *farina fecundans* being deſtroyed or injured, the grain would neceſſarily become affected and imperfect. That this diſeaſe is owing to ſome external cauſe, which prevails at the period we have mentioned, is, alſo, rendered more probable from the obſervation, that

corn, which, from being ſown in the ſpring, inſtead of autumn, or from any other cauſe, is kept backward in its growth, and does not flower till late, is much more ſubject to it than ſuch as more early attains that ſtate.

The Count ſeems, with others, to ſuppoſe the *ghiottone*, or mildew, like the two kinds of ſmut, to be infectious. But there is not the leaſt ground of obſervation for ſuch an opinion. The mildew is found promiſcuouſly every where, in a greater or leſs degree, according to the accidents of the ſeaſon, or the particular ſtate of the growing corn; and does not appear to be conveyed by grain affected with it to places where it was not found before: as is evident in the caſe of ſmut. The reaſon of this difference is eaſily aſſignable: allowing even the mildew, as well as the ſmut, to ariſe from *animalculæ*. For, if the other parts, and not the grain, be the nidus and place of habitation of the animalculæ; and the grain be only ſecondarily affected, and changed; the *ova*, or the *animalculæ* themſelves, will not be conveyed with the grain; nor conſequently propagated along with the ſeed-corn: as is the fact, with regard to thoſe that produce the ſmut: which are bred and inhabit in the grain. It is, therefore, highly probable, that the grain itſelf is not the ſeat of the animalculæ, which are the cauſe of thoſe appearances called the mildew: as it is

not

not found infectious: and, admitting this, the reaſon of its not being infectious, like the ſmut, reſults obviouſly thence.

The Count Ginanni, however, has adopted the notion, that the grain is infected, and contains a contagious matter that will propagate the diſeaſe with the ſeed. In conſequence of this, in treating of the remedies for it, he concludes, that the means of preventing it muſt lie in the deſtruction of ſuch contagious matter in the ſeed-corn. The firſt method he mentions for this end is, that dictated by our own countryman Bradley: who directs the ſteeping the ſeed-corn in a ſtrong brine, with ſome alum diſſolved in it; and then waſhing it well in freſh water, and ſeparating the light and imperfect grains. But the Count admits, that, on the moſt careful trial with all the precautions recommended by Bradley, he did not find this practice ſucceed, as to the *ghiottone*. It is not, indeed, to be wondered at, that it ſhould not. For, if the production of this diſeaſe depends on ſome exterior cauſe, attacking the corn at a certain ſeaſon, and not on any infectious matter in the grain, it can be of no avail here; though of conſiderable efficacy againſt the propagation of the ſmut.

The next remedy of this kind, the Count ſpeaks of, for the *grano ghiottone*, is the keeping the grain, ſuſpected of the infection, a long time in powder of arſenic. This, he

he ſays, will kill the ſmall animals in the inviſible cavities of the grain; and is a certain method of rendering the corn fertile by freeing it from them. The effect would probably enſue, if the mildew did really depend on *animalculæ* in the grain. But, as from the reaſons above-mentioned, it may be concluded that it does not, this treatment of the corn may be juſtly preſumed to be of no conſequence againſt that diſeaſe. There is juſt reaſon to preſume, that arſenic would be of efficacy, in deſtroying animalculæ, and minute vermin, which do injury to corn, by various ways of application: and there are authorities for believing, that it has on trial been found to improve fertility in a very conſiderable degree. But the danger, and inconvenience, from its very active virulence, of bringing it into common uſe; and, indeed, the expence of employing great quanties; are ſtrong reaſons againſt its introduction into general practice.

The laſt remedy, the Count mentions; and which, he ſays, is the moſt certain and eaſy that can be ſuggeſted; is the picking out, and taking away the ears affected with this diſeaſe, while the corn is ſtill growing.—Beſides the obſervations before intimated, in ſpeaking of this method, as a means of prevention of the *carbone*, with relation to its impracticability in large tracts of corn-land, it would be of no benefit in prevention of the mil-

mildew, unleſs that diſeaſe be really propagated by contagion with the ſeed-corn. But, this not being admitted, it ſtands on the ſame footing, as the other means we have juſt ſpoken of; and muſt be deemed of no avail.

The mildew appearing, on fair ground of obſervation to be owing to ſome exterior cauſe, acting at a certain ſeaſon after the corn is conſiderably advanced in its vegetation, all means of prevention by any change made in the ſeed, with a view to the deſtruction of animalculæ, muſt, of courſe, be inefficacious. The only principle, on which there ſeems to be any ground for preventive means, is the bringing the corn ſo forward, by early ſowing, or good tillage, as to render it ſtrong, and moderately early in the time of flowering: as weak and backward corn is more ſubject to the attack than ſuch as is vigorous and duly forward. — If any remedy can be applied when the cauſe of mildew is actually operating on the herb, it will moſt probably be found to be by ſmoking it with ſmothering fires, made with dried weeds, or other vegetable matter placed to the windward of the ground on which the corn grows. Allowing, as there is great reaſon to believe, that the mildew ariſes from the attack of flights of ſome very minute fly, or inſect, the ſmoking the places where the corn ſeems affected with it, on the firſt appearance of any ſymptoms of the diſeaſe, may, probably,

probably drive off, or deſtroy ſuch flies or inſects: as it has been found to do others of a ſimilar nature.—This ſeems the whole, that can be done againſt the *ghiottone*; which comes on inviſibly; and is not, ſo far as we know, like the cauſe of ſmut, which lurks in the ſeed, and may be there deſtroyed, within our reach, till it acts on the growing herb, and makes its miſchievous ravage.

Beſides the four *capital* diſeaſes of corn above treated of, the Count Ginanni enumerates ſeveral others of leſſer conſequence. Theſe are firſt IL GIALLUME: for which we have no correſpondent term in uſe with us. It ſhews itſelf, according to the Count, ſometimes in a thick yellowiſh matter within the coat, or in the grain itſelf; or on the leaves: or in ſpots, firſt of a whitiſh green, then yellowiſh, and laſt a reddiſh brown colour, ſucceeded by a dryneſs. Theſe appearances are evidently the effect of ſome ſpecies of blight; either a leſs degree of the RUGGINE before treated of, or ſome other, ariſing from a ſimilar, though more partial cauſe: or they are the conſequence of an accidental injury received by the plant from ſome inſect, or other animal; or from the rigour of the weather.—The Count ſpecifies as one cauſe of this diſeaſe, the ſulphureous vapour peculiarly found in certain ſoils. But there is no room, from adequate obſervation, to admit this notion: though there are not

wanting authors who advanced it before him, of this diſeaſe. For, as only particular parts of the plant are affected with the ſymptoms, the appearances do not agree with the ſuppoſition of ſo general a cauſe: and, indeed, according to the deſcription the Count has given, it cannot be properly conſidered as one diſeaſe of the herb; but as the ſymptoms of a topical diſorder of the parts, which may reſult from any accidental injury done to them.—The Count, with reaſon, acknowledges the impracticability of preventing, or removing the *giallume* from growing corn; unleſs that kind of it, which is of the ſame nature as the *ruggine:* and which, conſequently, admits of the ſame remedy.

The *ſecond* of the diſeaſes of inferior note mentioned by the Count, he calls IL GRANO VOTO: which may be tranſlated *empty grain*. The name itſelf, as he obſerves, gives the definition of the diſeaſe. He endeavours to inveſtigate the cauſes of it; but purſues that inquiry only by conjectural ſpeculations on the manner in which the grain may be deprived of that nutriment, requiſite to the formation of its internal ſubſtance. — The Count confeſſes that, after many experiments to find one, he is as ignorant of a general and effectual remedy for this diſeaſe as for the *giallume*, except where it is owing to injury done to the ſtalks by vermine: in which caſe, thoſe means which preſerve them from the vermine of courſe avail. The

The *third* of theſe diſeaſes of inferior note, mentioned by the Count Ginanni, he calls LA STERILITA DEL GRANO: in Engliſh, *the barrenneſs of corn.* It is found when the plants vegetate, and appear healthful in the leaf; but do riſe only to a ſmall height: and the ear does not flower; or fails in bringing forth perfect grain. The Count properly imputes this diſeaſe of corn to the faultineſs of ſoil: which may be various ways unſuitable to the corn.—The remedy for it, of courſe, lies in the correcting or amending the faults and defects of the ſoil: which muſt be done by thoſe uſual means, the particular nature of it dictates. The Count recommends, alſo, for that tendency to this diſeaſe, which appears when the grain becomes ſmaller and ſmaller, every year in the ſame place, owing to the natural poverty of the ſoil, as in mountainous grounds, to change the ſeed every year. He adds that, bathing the root, in a mixture of equal parts of milk and water, will preſerve the corn from this diſeaſe: as he ſays, he has found on actual proof by trial. But this, however true in experiment, is not reducible to practice, even for the obtaining ſeed-corn, where conſiderable quantities are wanted. It is, however, of great conſequence to the crops, to procure large and perfect grain to be ſown in places where it appears the ſeed degenerates in this manner.

The *fourth* of the inferior diſeaſes of corn ſpecified by the Count Ginanni, is named by him LA LUSSURIA DEL GRANO: in Engliſh, *the luxuriance of corn.* It is, as he ſays, a ſpecies of barrenneſs: becauſe, in conſequence of its overgrowth, the herb bears down to the ground; and the grain is longer than it ought to be; but with very little pulp and farinous ſubſtance. Beſides other inconveniencies that attend from what is called the *laying of corn.* — This diſeaſe ariſes from the faultineſs of the ſoil, as well as the other kind of barrenneſs; and muſt have its remedy in the correcting the quality, which occaſions it. But there is, alſo, as the Count mentions, an occaſional cure for this, which the other does not admit of. It is to be practiſed, when the corn is firſt perceived, in the ſpring, to riſe too faſt, by putting a flock of ſheep into the field, to crop the tender blade: which will prevent the ſtalks growing ſo heavy as to be laid by their weight: and it will, alſo, diſpoſe the plants to *tiller*, and produce more ears.

The *fifth* of the diſeaſes of leſs conſequence, mentioned by the Count, he calls, INFESTAMENTO DEGL'INSETTI: in Engliſh, *the being infeſted with inſects.* This does not ſeem to be ſo properly a diſeaſe, unleſs where the inſects are bred in the plant itſelf, as an injury from an external cauſe: though ſome other diſeaſe of the plant may contribute

butt to it.—The Count enumerates various cauſes of the abounding of inſects: but, as they are commonly known, it is needleſs to repeat them here.—In ſpeaking of the remedies for this evil, the Count ſpecifies ſeveral ſubſtances and compoſitions; which, poured or ſprinkled on the ground, will deſtroy, or drive away worms, and other ſmall animals injurious to plants. But this, though practicable in a garden, or for the preſervation of more valuable plants, can never be brought into common uſe for corn, where the large ſpaces of ground to be ſo treated would render it far too expenſive, and laborious for the farmer. He, alſo, mentions various fluid compoſitions and ſolutions, which are ſaid, if the ſeed be macerated in them, to prevent the attacks of inſects on the plants. But, if ſome of theſe preſerve the ſeed itſelf from being invaded before its vegetation, that is the whole they can effect. For there is not the leaſt ſhadow of ground to believe, they can give any qualities to the plants, which may protect them from ſmall animals. This is true of ſuch as are intended to deſtroy, or diſguſt the inſects: but macerations in ſubſtances, that conduce to the future vigour and health of the plants, if there be any ſuch, might tend to preſerve them from *animalculæ*, that are always apt to abound in weak and diſeaſed plants.—The only practicable general way of deſtroying or driving off

minute flies, or other ſmall animals which infeſt growing corn, is by ſmoke raiſed from burning vegetables, or ſulphureous foſſiles mixt with them, when to be obtained, fired to the windward of the places where the ſmall animals abound. This has been found very effectual againſt the conſequences of ſome blights; and in other caſes, where extraordinary appearances of the preſence of ſmall animals have been obſerved.

The *ſixth*, and laſt of the diſeaſes of inferior note, to which growing corn is ſubject, enumerated by the Count Ginnani, he calls IL PULLULER DEL ERBO ETEROGENE, in Engliſh *the multiplication of weeds*. This is, certainly, rather an external accident, injurious to the growth of corn, than a diſeaſe of it; and ſeems, with very little propriety, to bear that appellation. Indeed the Count himſelf appears ſenſible of it: and adopts the ſame only in conformity to former writers. —With reſpect to the remedy for this evil, he only touches ſlightly on the means of extirpation of the weeds in the way, they are commonly practiſed: and which are, perhaps, the only means of freeing the ground from them in general.

I have thus endeavoured, for the uſe of ſuch as cannot read Italian, or may be deterred by the tediouſneſs of peruſing a work rendered voluminous, by being more diffuſive than is neceſſary for practical information, to give

give the principal and ſerviceable part of the Count Ginanni's treatiſe on the diſeaſes of growing corn. If he has not broached many new diſcoveries in it, he has, at leaſt, made a more ample collection of what was before known, or promulgated, than is to be found elſewhere: and he has arranged his matter in the moſt methodical and uſeful diſpoſition. His deſcriptions of the ſymptoms and appearances of the ſeveral diſeaſes of corn, eſpecially of the four principal, are juſt, full, and clear: and his diſtinctions of them are better founded than thoſe of any former writer.—The world is, therefore, highly obliged to him for his labours on this important ſubject.—The forming ſyſtems of knowledge in matters, the improvement of which depends partly on abſtracted ſcience, and partly on particular obſervations and trials, is the only means of a ſpeedy progreſs of ſuch matters towards perfection.—It is neither neceſſary for the end, nor, indeed, poſſible, in the compoſition of ſuch ſyſtems, that they ſhould be complete at their firſt eſtabliſhment. But if they contain a copious account of the ſubject judiciouſly digeſted, though in ſome points defective, or erroneous, they will ſeldom fail to promote the intended view. For the voids will be afterwards eaſily filled up, or the miſtakes rectified, either by the original author himſelf, or by others, who may ſucceed, as opportu-

nity of more extenſive or accurate information may preſent itſelf. We have a ſtriking inſtance of this, in the immenſe additions, and numerous corrections, made by Linnæus to the firſt fruits of his efforts to form ſyſtems of natural hiſtory.

In my own treatment of the Count's work, or my collateral diſquiſition of the ſeveral ſubjects of it, I have endeavoured to do him juſtice; and yet, at the ſame time, not ſpared to comment freely on what he has advanced, where the ſupport or elucidation of any material truth rendered it expedient. As the only laudable end of all writing is to convey juſt, as well as more extenſive notions of the ſubject, every other motive ought to give way to the promoting that intention: and the Count ſhews himſelf too much animated with this ſentiment, not to excuſe, or even approve of thoſe liberties, which, with all the reſpect imaginable for him, I have taken in this work.

ARTICLE

ARTCLE XII.

*Account of various Methods of Rearing and Fattening Hogs, verified by Experiments * : communicated by* ARTHUR YOUNG, *Esq. to the* Society for the Encouragement of Arts, Manufactures, and Commerce; *and inserted at their Request.*

To *Robert Dossie*, Esq.

SIR,

I AM directed by the Society for the Encouragement of Arts, Manufactures, and Commerce, to send you Mr. ARTHUR YOUNG's Account of feeding Hogs, in order to be inserted in the Memoirs of Agriculture, &c. if you think proper.

By Order of the Society,

GEORGE BOX, Secretary.

* This account was sent to the Society in claim of the præmium of a gold medal offered, by them, for *the best Account of a Method of Rearing and Fattening Hogs, verified by Experiments*; and was adjudged to be intitled to it.—A surreptitious copy of the account was inserted in a periodical pamphlet: which was so incorrect as to induce Mr. Young, as he says, to desire to publish immediately a more perfect edition of it himself: for which, on an application, he obtained the consent of the Society. But the difficulty, which attends the circulating little fugitive essays on particular subjects in the country, where principally those of this kind are useful, has disposed the Society to wish, that all the valuable pieces procured by their

EXPERIMENT I.

THE firſt week in March, 1765, thirty pigs, juſt weaned, were drawn from forty-three, that they might be all of a ſize; they were then diſtributed into five lots, equally divided; I do not think there was half a crown difference in the value of them; and then fed with diſtinct ſorts of meat. Each five had a ſtye to themſelves, and all were kept clean, and equally littered with ſtraw.

Lot N° 1. Was fed with pollard mixt with water.

2. With pollard, mixt with ſkim milk.

3. With boiled turnips, and pollard mixt with the turnip-liquor.

4. With boiled potatoes and water.

5. With ſkim milk *.

their means for the public, ſhould be tranſmitted in ſome larger work; where they may be more extenſively ſpread, and more certainly preſerved. In conformity to their requeſt, I have inſerted this account here; and hope that reaſon will be a ſufficient apology for ſo doing, notwithſtanding the two former publications of it. R. D.

* Skimmed milk is frequently applied to the feeding and fattening hogs, as well as to the rearing pigs. The pork is ſweeter and firmer than the fleſh of hogs fattened with any other kind of known food: and it will take ſalt in the heat of ſummer. It is practiſed by ſome farmers to bring the hogs up with waſh and butter-milk, or ſkimmed milk promiſcuouſly; and then, to fatten them with ſkimmed milk only: which, they ſay, gives the greateſt firmneſs to the fat of the bacon.—Mr. Young, in a preſatory

They were kept with this food thirty days. I then turned them out of their ſtyes (none had died) and viewed them with a perſon particularly ſkilled in hogs; the reſult was,

ſatory remark to theſe experiments, condemns the application of the milk to this purpoſe. He ſays:

"It is the practice of ſeveral countries to uſe the ſkim-"milk, butter-milk, and whey in fattening hogs. "This is *a moſt pernicious cuſtom:* That food for ſuch a "uſe, it is every-where known, has twenty ſubſtitutes, "viz. peas, beans, buck-wheat, barley, &c. &c. &c.: "but it is not ſo generally known, that pigs may be "reared without cows. It is agreed, that the dairy-"food is excellent for the latter purpoſe." Mr. Young, conſequently, directs the view of his experiments to two ends: the finding other food for fattening hogs; and, by that means, confining the application of the dairy-food to the feeding the pigs after they are weaned, and the ſuckling ſows: and the providing a ſubſtitute to milk, even for rearing pigs, where that is wholly wanting, or deficient in quantity: which being obtained, he preſumes a greater number of hogs may be profitably brought to the market. In order to this, he ſays: "The ſows and weaned pigs, ſhould evidently be "proportioned, in ſuch a manner, to the number of "cows in milk, as to conſume all the dairy-food "without waſte. And other ſorts of food provided for "the keeping ſows that have no pigs.—hogs half,— "three-fourths, — full-grown, — and fattening ones." From the ignorance, or neglect of managing this point rightly, he declares, "There are many dairies, that do "not maintain one tenth of the ſwine, they might, "with proper management." The obſervation, that the milk applied to the uſe of feeding hogs is not confined to the purpoſes here mentioned, is almoſt generally true. For it is given, for the moſt part alone, or with other food, to ſwine of all ages, or under all circumſtances. R. D.

N° 2. The beſt, pollard and ſkim milk.
5. Next beſt, ſkim milk.
1. Next,—pollard and water.
3 and 4. Equal.

It appears from hence, that pollard and milk are the beſt food; milk alone, very good. The other articles advantageous (for none of the pigs were in bad order) though not equal to the former.

EXPERIMENT II.

At the ſame time with the preceding trial, four lots of pigs, that had been weaned three months, were equally drawn from my farm-yard, five in each lot. They were confined as before, each lot to a ſtye, and cleaned at the ſame time: their food was as follows:

N° 1. Bran mixt with ſkim milk.
2. Boiled potatoes.
3. Boiled carrots.
4. Raw carrots.

They were kept to this food thirty days; I then viewed them as before, with the ſame perſon.

N° 3. Much the beſt, boiled carrots.
1. Next, — bran and ſkim milk.
2. Next, — boiled potatoes.
4. Worſt, — raw carrots.

Boiled

Boiled carrots appeared very clearly on this trial to be an admirable food for hogs of this age; *ſo good*, that I determined to make uſe of this hint in future. Boiled potatoes appear alſo a good food *. Raw carrots keep them, I think, better than the farm-yard, but were not equal to the other kinds.

EXPERIMENT III.

January 1, 1766: forty pigs, that had been weaned about a fortnight, were draughted very equally into eight lots, and confined each to a ſtye; they were cleaned out, and littered always on the ſame day, equally. Their food was as follows:

N° 1. Raw carrots.
2. Boiled ditto.

* A large field of experience, elſewhere, has ſhewn, that potatoes are an excellent and cheap food for hogs; as well for bringing up, as fattening them. In Ireland, particularly, great numbers of ſwine are reared; and fattened with them: and it is allowed, that the bacon is very good.

The difference betwixt boiled and raw potatoes, in the feeding hogs, has not been hitherto well aſcertained. But if it ſhould prove, that there are no material diſadvantages attending the omiſſion of the boiling this root, of which, the *new or conglomerate ſpecies treated of in a following article*, may be produced at a very ſmall expence, they will appear to be the moſt cheap and convenient kind of food, as well for rearing as fattening ſwine hitherto diſcovered. R. D.

3. Boiled

3. Boiled potatoes.
4. Pollard mixt with ſkim milk.
5. Ditto mixt with boiled turnips.
6. Malt-duſt mixt with ſkim milk.
7. Skim milk.
8. Ditto, and half carrot-water boiled.

They continued upon this food the [illegible]onth of January, and were then viewed; the reſult was as follows:

N° 4. The beſt, pollard and milk.
7. Next, — ſkim milk.
2. Ditto, — boiled carrots.
3. Ditto, — boiled potatoes.
5. Ditto, — pollard and boiled turnips.
8. Ditto, — ſkim milk and carrot-water.
1. Ditto, — raw carrots.
6. The worſt, two dead, malt-duſt and ſkim milk.

Pollard and milk hitherto maintain the ſuperiority; boiled carrots excellent; the reſt almoſt equal, except the malt-duſt, which is evidently bad.

EXPERIMENT IV.

In the beginning of June, 1766, I confined ſixty hogs, half and three-fourths grown, in my hog-yard (a pond's mouth in it), and fed them fourteen days with clover mown freſh

freſh every day; it was given in their troughs, with ſacks acroſs, to prevent their ſoiling it. They fell off in their looks in about four days, and grew worſe and worſe, ſeveral dying. At the end of that time, I gave them ſome malt-grains and waſh every day, for a few days longer; but the effect was no better, more dying. They were then all turned into the clover-field, from whence it had been taken, and confined conſtantly to it for ſome time. Not one more died, *for they all throve* greatly *. It will not, perhaps, be impertinent here to add, that I never found any method of uſing clover more bene-

* The *thriving* here mentioned is confined, in its meaning to the hogs attaining to a good condition to be fattened: but not growing fat, properly for market. For Mr. Young ſays, in his preface, "The practice of ſome "counties, as well as the annexed experiments, prove, "that clover is a moſt capital object in *keeping* all theſe "ſorts of ſwine: but thoſe writers, who aſſert, that it "will *completely fatten* them, go much too far." But the gaining ſo cheap and eaſy a way of keeping them till they acquire a proper age to be fattened, as the turning them into a clover-field, and ſuffering them to remain there till taken out to be fattened, without any further care or trouble, is a matter of the utmoſt conſequence to this branch of huſbandry: as he obſerves thus: "There is no ſort of cattle in a farm, that requires "more attention than hogs. Any method, therefore, "that ſimplifies the management muſt be peculiarly "valuable." The method of rearing hogs, here propoſed, has this merit in the higheſt degree: and the feeding the hogs in winter with raw carrots, or parſnips, or potatoes, is almoſt equally ſimple. R. D.

ficial

ficial than thus applying it to the feeding of hogs *.

* Mr. Young, in his prefatory remarks, corroborates what he has here advanced, as to the benefit of feeding hogs on clover; and gives some hints, as to the manner of management of it. He says, "Hogs, that are a "quarter (or upwards) grown, may be absolutely confined to a clover-field until it is necessary to sow wheat: "nine tenths of Britain will doubt this fact, but I "have repeatedly experienced the truth of it. The "fences, it is unnecessary to add, must, in this system "be incomparably good; — which necessity, I apprehend, is a particular merit in a mode of Husbandry; for "a conduct that forces the farmer to have excellent "fences, is, so far, of great utility. It is, also, requisite to add, that there must be a pond in the field, "which never fails. In a good crop of clover well "fenced and watered, swine of this sort may be locked "up from the middle of May to Michaelmas; and no "consumption of the clover will pay the farmer better: "I could add many experiments to prove this assertion; "but a certain brevity is requisite in such slight essays "as this." In another place, of the prefatory remarks, Mr. Young asserts, he has found "that ninety hogs "will, in fatting, yield as much manure as is worth "thirty pounds on the spot. —— And where straw "or stubble are to be had cheap, to a much greater "amount."

This acount will appear very extraordinary, as to the quantity, and value of the hogs dung produced by the ninety swine while fattening, to all who have not made particular observations on the subject; but especially to those who have retained the former prejudices against the use of hogs dung at all, as a manure. It is but a few years ago, since this prejudice was almost general in the North of England; and I have seen, in Yorkshire, particular caution used, that the cleansings of the pig-stye should not be mixt with the dung-hill for manure; but thrown away as noxious to the land.

EXPE-

EXPERIMENT V.

At the time of the preceding experiment, eight hogs, of equal ſize, were divided into two lots, and confined to two ſtyes. Four were fed fourteen days on clover mown, and the other four on lucerne mown; they were given at the ſame time, and in the ſame ſtyes. At the end of that time they were viewed attentively: both were bad, but the clover ones much the worſt, one near dying.

EXPERIMENT VI.

The month of December, 1766, twenty pigs, that had been weaned a month, were draughted into four parcels, and kept that month, ſeparately, in the following manner:

N° 1. Boiled carrots.
2. Boiled potatoes.
3. Boiled turnips.
4. Boiled cabbages.

At the end of the month they were turned out, and viewed attentively. The reſult was,

N° 1. The beſt, boiled carrots.
2. Next, — boiled potatoes.
3. and 4. equally, all nearly dead.

Carrots continue in every trial ſuperior to all common vegetable food. I am not at all ſurpriſed at the ill ſucceſs of turnips and cabbages.

EXPERIMENT VII.

In June, 1767, I draughted from my [illegible] twenty that were of a perfect equality in ſize and appearance; they were even half grown; marked them into four lots, and turned

N° 1. Into my clover field.
2. ——— lucerne ditto.
3. ——— ſainfoine ditto.
4. ——— burnet ditto.

In another month they were drove up and viewed; the reſult was,

N° 2. The fineſt, lucerne.
1. Next, —— clover.
3. Next, —— ſainfoine.
4. Very indifferent, burnet.

The reſult of this experiment I think deciſive in favour of lucerne, and likewiſe in the proportionable merit of the other articles. But this muſt be farther enquired into in future experiments.

EXPE-

EXPERIMENT VIII.

In January, 1769, three ſows, very much alike in all reſpects, pigged, one ſeven pigs, another eight, the third ſix, in about a week. I ordered them to be fed diſtinctly.

N° 1. With raw carrots.
2. With ſkim milk.
3. Common waſh of the better ſort.

In a fortnight they were viewed. The pigs of

N° 2. Were the fatteſt, ſkim milk.
1. Next, —— raw carrots.
3. Worſt, —— common waſh.

This experiment is not deciſive, for reaſons too tedious to mention; but yet the reſult ſhould urge the attentive to vary theſe experiments, that certainty may at laſt be known.

OBSERVATIONS.

The general reſult of theſe experiments is drawn into one view in a very few words.

Milk mixt with pollard appears to be, of all food, the moſt proper for rearing of pigs.

Milk alone is good *.

Boiled carrots, excellent, and fully proved to be ſufficient for any farmer to depend on, who does not keep a good dairy.

* That milk alone, or with the addition of ſome farinaceous food, is good for the rearing pigs, common practice has made evident. The intention of Mr. Young's experiments was to find a ſubſtitute for it, where wanting; or that it might be applied ſolely to this purpoſe, and not to the keeping ſows that have no pigs, feeding hogs after they be full-grown, or fattening ſwine, when at their proper growth. In the purſuit of this, he had due regard to the two different ſeaſons of the year: as herbage, which is the cheapeſt food, cannot with certainty be obtained in winter.—We have in the foregoing notes quoted what has been ſaid in recommendation of clover for this purpoſe, in his prefatory remarks. He adds, in another place, "I have found lucerne to "be equal to clover; and, in ſome years, ſuperior for "this purpoſe.—Sainfoine is, alſo, of excellent utility; "but rye-graſs, and burnet, will not, by any means, "do.——Natural paſtures, with waſh, are a good ſub-"ſiſtence; but never will be found to equal the artifi-"cial graſſes." This is the moſt profitable ſummer-food: with relation to the winter-diet, he ſays:

"But in making the greateſt advantage of a dairy, "we muſt not confine ourſelves to the ſummer-keeping "alone. Proviſion muſt be made for winter-feeding "ſuch hogs as do not require aſſiſtance from the dairy."

The following experiments will prove "that carrots, "parſnips, beets, and potatoes, are of admirable uſe in "feeding pigs that have been reared.—They will keep "the hogs that have been taken out of the clover in ex-"cellent order, and even fatten them, and maintain, "to vaſt advantage, ſows that have no pigs."

A ſtock of theſe kinds of ſummer and winter-diet for the hogs, together with the milk of the dairy, make a complete proviſion for the feeding hogs: and where milk is wanted, boiled carrots, potatoes, or parſnips, may be uſed as a ſubſtitute.

Potatoes

Potatoes are alſo a very good food *.

Turneps, cabbages, and malt-duſt very bad †.

* According to theſe experiments, common potatoes, though good, are inferior to carrots and parſnips, for the keeping and fattening of ſwine. But, from the ſweetneſs and ſolidneſs of the *new or conglomerated kind*, there is great [illegible] to believe it will be equally nutritive with [illegible] roots. This, though not hitherto determined from any accurate experiment, may be further preſumed from the great fondneſs which the hogs ſhew for this kind of potatoe, even when raw. For they will leave other food when they ſmell the ſcent of theſe roots while growing; break through the fences to come at them; and can ſcarcely be driven out of the field by any force, till they be glutted with the potatoes. R. D.

† In an experiment, below-mentioned, it appears that on keeping four pigs on raw turneps, for three weeks, three died, and one was near dying.

There are inſtances, nevertheleſs, where hogs have been fond of turneps, that have grown on particular land, and thrived with feeding on them: though they have refuſed thoſe, which grow on other land in the ſame neighbourhood, and could not be brought to eat them till they were almoſt ſtarving. The circumſtances of ſoil, and the ſpecies of the root, ought to be particularly attended to in experiments of this kind, before general concluſions can be formed. Some ſlighter trials give room to doubt, whether the new ſpecies of turnep, called the *turnep-rooted cabbage*, or *cabbage-turnep*, to diſtinguiſh it from the common turnep-cabbage, may not keep hogs. Its weight, ſolid conſiſtence, and nut-like flavour, favour this notion; and render further experiments worthy purſuit. It is now known, that an acre of this plant will produce upwards of forty tun: and it will bear cultivation on a variety of ſoils, where carrots and parſnips would fail to yield a moderate crop. The herbage might be uſed to advantage for cattle and ſheep; while the root was reſerved for the hogs if it prove a good food for them. R. D.

Of green food, that which is growing, is clearly the beſt; mown, and given in ſtyes, it is pernicious.

In the field, lucerne is ſuperior to all the reſt. Clover comes next, then ſainfoine: all theſe are good. Burnet laſt, and bad *.

* Mr. Young makes the following obſervations, in his prefatory remarks, on the whole of theſe experiments. "By this general ſyſtem of management, it appears, that hogs are to be maintained the year through upon clover and theſe roots;—and recourſe had to the dairy only for aſſiſtance in feeding ſows, that have pigs; and rearing their young."

"It muſt be extremely evident, that, with this conduct, the number of ſwine maintained on a dairy-farm may be prodigious. — The number of cows point out the number of ſows and pigs: and theſe, again, muſt proportion the number of acres applied to the production of clover and roots. Thus the whole chain of crops is connected: and each field the ſupport of the other.

"The ſecond object, in the management of ſwine, is the ſubſtituting ſome food in the room of a dairy, for rearing pigs, upon ſuch farms as keep no cows. This is an object of very great importance: as there are numerous extenſive tracts of country, that will produce clover in very great perfection; and, alſo, many ſorts of roots; but where it is either unprofitable to keep cows; or only advantageous to ſuckle them." — I found, from repeated trials, that carrots, and parſnips, will wean pigs of a proper age, almoſt as well as milk;—that is, in ſuch a degree of perfection as to render the keeping a large number of hogs upon that dependence extremely adviſeable to any farmer whoſe buſineſs, or ſituation may prompt him to do it: and other experiments aſſured me, that ſows, with the moſt numerous litters, may be maintained to great profit in the ſame manner.—Potatoes, and red beets,

"I,

" I, likewiſe, found of very great uſe for the ſame " purpoſe.

" It may not be improper, here, to conſider the con- " ſequence of enabling the farmer to keep large ſtocks " of ſwine, by means of roots, ſo extremely productive, " as thoſe, I have mentioned. There are no ſoils but " what, with proper management, will yield ſome or " other of them: and the crops are immenſe.—The " number of ſwine to be fattened, or fed by an acre " of carrots, or potatoes, would ſurpriſe thoſe who " have never formed any experiments upon the point: " and the excellence of the huſbandry, in general, " ſhould plead powerfully with farmers to adopt it up- " on this principle. Theſe roots are all fallow crops: " that is, they are of the ſame advantage to the " ſoil, as a year of fallow: — and, if cultivated in the " manner they ought to be, much ſuperior to any " fallow. For this reaſon their culture is beneficial to " the land; and a very material method of bringing it " into excellent heart. Their application to feeding " ſwine is, alone, ſufficient to improve a farm, that is " not almoſt worn out: ſince it cannot be conducted " without raiſing large quantities of the very beſt dung.

" Now the conſequences of adopting the culture of " vegetables, that clean, and meliorate the ſoil; and " in their uſe infinitely enrich it, muſt be obvious to " every reader. It is no exaggeration to aſſert, that " the beſt ſoils may be improved, and the pooreſt con- " verted into good ones by this conduct;—and, I can " aſſert an experiment cheaper than any other method.—

" It is from theſe ſeveral conſiderations, that I appre- " hend the following experiments may be of real uti- " lity to thoſe who have dairies;—to thoſe, who keep " cows, but apply them to ſuckling;—to thoſe, who " have no cows, but are willing to keep ſwine;—and, " laſtly, to thoſe who, on any ſoils, are deſirous of im- " proving them."

The plan of improvement here ſpecified is perfectly correſpondent with the intention of the Society in their offer of a premium for the beſt account of a method of rearing and fattening hogs. R. D.

Experiments on Fattening of Hogs.

EXPERIMENT I.

In February, 1765, I weighed a buſhel white boiling peaſe, the weight was ſeven one pounds, the price 4*s*. A buſhel of p twenty-five pounds one quarter, price 8 *d*. A buſhel of bran, fifteen pounds one quarter, price 6 *d*. Quere, which is the cheapeſt food for hogs, ſeventy-one pounds at 4 *s*. or twenty-five pounds at 8 *d*? The peaſe are ſix times the price of the pollard, and only three times the weight.

THE TRIAL.

I drew four pigs from my herd, of equal appearance, divided them into two lots, and weighed them alive.

		S.	P.
N° 1.	weighed	6	5
2.	———	6	7
3.	———	6	3
4.	———	6	8

Lot. 1. contained the hogs N° 1. and 2, weight 12 S. 12 P.

Lot. 2. contained the hogs N° 3. and 4, weight 12 S. 11.

The

The equality of theſe weights is remarkable; but in an hundred hogs, I do not think my bailiff would miſtake two pounds in half a dozen ſtone.

Lot 1. was confined to a ſtye, and had eight buſhels of peaſe given them, weight 565 pounds, price 1 *l.* 12 *s.*

Lot 2. was confined to a ſtye, and had forty-eight buſhels of pollard given them, weight 1212 pounds, price 1 *l.* 12 *s.* Both the pollard and peaſe were given dry, with water in a trough. Each lot was weighed, as ſoon as the food was done. The reſult was,

	S.	P.		
N° 1. weighed	19	2		
2. ———	21	5	S.	P.
Superiority of N° 2. is			2	3
Add 1 pound, the firſt inequality			0	1
Total ſuperiority			2	4

A ſingle experiment muſt not be ſuppoſed to decide this matter, but future ones may determine it.

EXPERIMENT II.

In January, 1766, I drew from the herd ten hogs, as equal in ſize as poſſible, and weighed them alive in five lots.

N° 1.

		S.	P.
N° 1.	weighed	13	4
2.	——	12	6
3.	——	13	0
4.	——	12	11
5.	——	13	1

A nearer equality than this, in matters that can neither be added to nor diminished, can ſcarcely be expected.

N° 1. was fatted with white peaſe that weighed ſixty-ſix pounds per buſhel; the price 30 *s.* per quarter.

N° 2. with pollard that weighed twenty-two pounds per buſhel; the price 9 *d.* per buſhel.

N° 3. with buck-wheat, that weighed forty-ſeven pounds per buſhel; the price 2 *s.* 3 *d.* per buſhel.

N° 4. with boiled potatoes, that weighed fifty-four pounds per buſhel; the price 2 *s.* per buſhel *.

* The new, or conglomerate potatoe, beſides its much more nutritive quality, affords more than double the product per acre, of the common potatoe; and, on worſe ſoils, with little manure. So that when it is ſubſtituted inſtead of the common kind, at the price here rated, the comparative expence will be greatly different: and if, as there is great reaſon to believe, the hogs will grow fat with this kind, though given to them raw, a further ſaving will be found in the omiſſion of the boiling. Whence the proportion of the expence of the potatoes conſumed, compared with that of peaſe, pollard, buck-wheat, and boiled carrots, would be as 1 *l.* 4 *s.* to 3 *l.* which would unqueſtionably render this kind

N° 5. with boiled carrots, that weighed raw fifty-five pounds per buſhel; the price *s.* 1 *d.* per buſhel.

I thought it beſt to fix on a given ſum, as proper to fat each hog. The people I conſulted were of opinion, that eight buſhels of white peaſe were neceſſary to fat one ſuch hog well. This I accordingly fixed on as my criterion. The account of the expence, therefore ſtood thus:

		l.	*s.*	*d.*	
N° 1.	Peaſe, 16 buſhels	3	0	0	
2.	Pollard, 80 buſhels	3	0	0	
3.	Buck-wheat, 27 buſhels	3	0	9	
4.	Potatoes, 28 buſhels	2	16	0	
	Labour and coals,	0	4	0	
					3 0 0
5.	Carrots, 49 buſhels,	2	13	2	
	Labour and coals,	0	6	10	
					3 0 0

Each lot was weighed as ſoon as the food was done. The reſult was as follows:

kind of potatoe far the cheapeſt article hitherto applied to the purpoſe in queſtion. There is, moreover, ground to conclude the defect of weight, found in the hogs fed with the potatoes, in this account, would not happen were this kind uſed: as well from the greater fondneſs the hogs have for it, which would incite them to eat more; as from its more nutritive quality, apparent from its greater ſolidity, and much ſweeter taſte; which demonſtrates it to contain a greater quantity of ſaccharine juice: the chief alimentary part of vegetables.

N° 1.

		S.	P.
N° 1.	weighed	27	6
2.	——	27	9
3.	——	29	13
4.	——	25	7
5.	——	31	0

It is evident from this experiment, that carrots boiled are ſuperior to any of the other food. I did not expect that potatoes would be much inferior; but I have found from divers other trials ſince, that it is requiſite to mix the meal of ſome kind of corn with them. Pollard in this trial, as in the laſt, is ſuperior to peaſe.

In January, &c. 1766, having a large number of hogs fatting, I purchaſed various kinds of food for them, which were given them, ſome alone, and others mixt together, to diſcover which fatted them in the cheapeſt and quickeſt manner; this being, in the opinion of ſome, a fairer way of diſcovering the nature of every kind of food, than the other method.

EXPERIMENT III.

Seventy-ſix hogs, from ſeven to fourteen ſtone lean, eat in ſeven days, after nine days fatting,

	l.	*s.*	*d.*
17 quarters 5 buſhels, pollard -	5	17	10
1 quarter, beans - - -	0	4	0
7 quarters 2 buſhels, peaſe, ground	10	17	6
3 quarters 5 buſhels, or 2*l.* 7*s.*			
per diem	16	9	4

EX-

EXPERIMENT IV.

Eighty-eight hogs eat in twelve hours,

Q.	B.		l.	s.	d.
1	6	buck-wheat - -	1	11	6
0	2	peaſe-meal - -	0	8	0
1	3	bran - - -	0	5	6
3	3	- - -	2	5	0

EXPERIMENT V.

The ſame hogs eat next day,	l.	s.	d.
2 qrs. of white peaſe	3	0	0

EXPERIMENT VI.

The next day,	l.	s.	d.
1 quarter of peaſe - - -	1	10	0
2 buſhels of buck-wheat - -	0	4	6
	1	14	6

From this day's quantity, I ſhould think they either did not like the buck-wheat ſo well as the peaſe, or the buck-wheat is a much more filling food; but two quarters of peaſe were the greateſt quantity of that grain they eat in one day, during the whole fatting.

EXPERIMENT VII.

The next day they eat	*l.*	*s.*	*d.*
2 quarters of buck-wheat	1	16	0

This day's fatting is, in ſome meaſure, a proof that buck-wheat is an agreeable food to them, ſince they eat as large a quantity as of peaſe; but they ought to have as much more of it, if the proportion lies in the weight and price.

EXPERIMENT VIII.

The next day they eat	*l.*	*s.*	*d.*
2 quarters and a half of peaſe-meal, buck-wheat flour, and pollard mixed, the proportion 13*s.* 4*d.* per quarter	1	13	4

EXPERIMENT IX.

The next ſeven days they eat	*l.*	*s.*	*d.*
22 quarters and a half of the above mixture, at 13*s.* 4*d.* per quarter - -	15	0	0
1 quarter and a half buck-wheat	0	18	0
7 buſhels of peaſe - -	1	7	0
3 quarters and a half is 2*l.* 9*s.* per day	17	5	0

The

The quantity of the hogs eat this mixture, and their thriving extremely well with it, is a ſtrong proof that the different qualities of the ſeveral grains being finely incorporated in the mixture of their flour, contributed much to the forwarding of their fatting; and the proportions ſhew that they eat more than when fed with one only.

EXPERIMENT X.

The next day they eat	*l.*	*s.*	*d.*
1 quarter of buck-wheat -	0	18	0
7 buſhels of peaſe - -	1	7	0
	2	5	0

EXPERIMENT XI.

The next day they eat	*l.*	*s.*	*d.*
1 quarter 4 buſhels of peaſe -	2	5	0

EXPERIMENT XII.

The next day they eat	*l.*	*s.*	*d.*
1 quarter 4 buſhels of peaſe -	2	5	0
1 buſhel of buck-wheat - -	0	2	3
	2	7	3

EX-

EXPERIMENT XIII.

The next eighteen days they eat,	*l.*	*s.*	*d.*
24 quarters 1 buſhel of peaſe-meal	39	0	0
6 quarters of barley-meal	7	4	0
1 quarter 1 buſhel buck-wheat flour	1	2	
7 quarters 4 buſhel of pollard	2	5	0
1 quarter of bran	0	5	4
2 quarters 1 buſhel is 2*l.* 15*s.* per day			
	49	16	10

The difference of two quarters and three and a half, in Experiment IX, is remarkable, and ſeems to prove that the hogs eat by weight and value, and not by meaſure: the quantities are very different, but the prices do not vary equally. N° 10, 11, 12, are *whole grain*, at forty-five pounds per day. *This* is all ground, and they eat ten pounds a day more: from which I conclude that the meal fattens much the beſt.

EXPERIMENT XIV.

The next day they eat,	*l.*	*s.*	*d.*
1 quarter 4 buſhels of peaſe-meal	2	6	6

EXPERIMENT XV.

The next day they eat,	*l.*	*s.*	*d.*
1 quarter 5 buſhels of peaſe-meal	2	10	4

EX-

EXPERIMENT XVI.

The next day they eat,	*l.*	*s.*	*d.*
1 quarter 7 buſhels of peaſe-meal. - - -	2	18	0

EXPERIMENT XVII.

The next three days they eat	*l.*	*s.*	*d.*
5 quarters 2 buſhels of peaſe-meal - - -	8	2	9

1 quarter 4 buſhels is 2*l.* 14*s.* 3*d.* per day.

EXPERIMENT XVIII.

The next day they eat,	*l.*	*s.*	*d.*
1 quarter 4 buſhels of peaſe-meal - - -	2	8	0

From all theſe trials, it appears that the meal is better than the whole grain.

EXPERIMENT XIX.

In January, 1768, I confined three hogs to different ſtyes, and fed them thus,

N° 1. with peaſe.
2. —— beans.
3. —— barley.

to ſee which pork was beſt and firmeſt. They were, in every reſpect, as equal as poſſible.

N° 3. The whiteſt fat, and firm, and well-taſted meat.

1. The next in whiteneſs, and equally firm.
2. Very dark and ill-taſted, but firm.

OBSERVATIONS.

It appears from theſe experiments, that pollard alone (at the preceding prices) is a cheaper food than peaſe alone.

That boiled carrots is much the moſt profitable food that has been tried *.

That buck-wheat is a more profitable food than peaſe.

That ſeveral kinds of food mixed, is better than being given alone.

* This muſt be underſtood only of the kinds of food above enumerated, as tried in theſe experiments already ſpecified. For, in the experiments below given, which Mr. Young ſubjoined in his publication, to thoſe related in his account to the Society, he acknowledges that parſnips were found in one trial ſuperior to carrots. This is by no means extraordinary, if we conſider how much more the parſnip appears, by its ſweetneſs, to abound in ſaccharine juice than the carrot. For the ſame reaſon, we may conjecture, the *ſkirret* to excel both of them for this purpoſe: and the product of it in ſome ſoils is far greater than that of the others. It were, therefore, to be wiſhed, that ſome comparative trials were made of theſe three kinds of roots, applied to this purpoſe. R. D.

That

That the meal of any one, or of various kinds of grain, is better and more profitable than the whole grain, mixed or alone.

That peaſe and barley are a much ſweeter food than beans.

The above experiments are humbly ſubmitted to the Society, not as perfect, but rather as a mark of the Author's wiſhes to be uſeful. He ſhall not be diſpleaſed to find that others have been more accurate and attentive than himſelf *.

ARTHUR YOUNG.

* To the above account delivered to the Society, Mr. Young, in his publication of it, added the following additional experiments.

I.

"In January, 1766, twenty pigs, that had been "weaned ſix weeks, were draughted into four parcels, "and kept for three weeks upon the following articles "of food:

"N° 1. Boiled carrots.
"2. —— parſnips.
"3. —— red beets.
"4. —— potatoes.

"They were then viewed, and the reſult;

N° 1. The beſt.
"2. The next beſt.
"3. The next; very near equal to N° 2.
"4. The worſt, but very good.

"The difference between them but little.

"Carrots, in this trial, appear to be ſuperior to the "other articles;—but not ſo much as to prove deciſive.

II.

"In February, 1766, drew ſix lots of pigs, four in "each;—the equality very exact; and, confining them

" to ſeparate ſtyes, fed them in the following manner
" three weeks:

" N° 1. Raw carrots.
" 2. —— parſnips.
" 3. —— red beets.

" N° 4. Raw potatoes.
" 5. —— Jeruſalem artichokes.
" 6. —— Turnips.

" At the end of that time viewed them;

" N° 1. The beſt; in good order.
" 2. } Next; equal: theſe alſo in good order.
" 3. }
" 4 and 5. The next; equal.
" 6. Three dead; and the other dying.

" Carrots, parſnips, and beets, are excellent food; po-
" tatoes and artichokes, the ſame, though in a ſome-
" what inferior degree: turnips wretched.

III.

" In January, 1767, drew three lots of weaned
" pigs, and fed them a fortnight as follows:

" N° 1. With boiled carrots.
" 2. —— parſnips.
" 3. —— beets.

" Viewed them at the end of that time; the reſult,

" N° 2. The beſt.
" 1. The next.
" 3. The laſt.

" But all in good order. Parſnips, being ſuperior
" in this trial to carrots, contradicts, ſo far, the re-
" ſult of the preceding experiments; but a few trials
" muſt never be conſidered as deciſive. In all agricul-
" tural ones, the general averages are the points alone
" which carry conviction.

IV.

" The 6th of January, 1767, confined ſix pigs, two " months old, to a ſtye, and fed them for ſix weeks with " nothing but boiled Jeruſalem artichokes, and the " common waſh that is given to lean hogs, as a trial " to diſcover how far that root may be depended on " for feeding ſuch pigs. The reſult was favourable; " at the end of the time they were viewed, and found " to be in good order;—not ſo well-looking, as I have " often had ſuch pigs kept on other meat;—but well " enough to ſhew that this food is a matter of much " importance."

The public are greatly obliged to Mr. Young for theſe ingenious experiments and accurate obſervations. If, from the want of repetition they are not deciſive in every point, yet they afford great lights for the more eaſily attaining a determination on the important queſtion, how hogs may beſt and moſt cheaply be reared and fattened for the market?

ARTICLE XIII.

OBSERVATIONS *on making* BRE *exhibiting the Means of diſtinguiſhing good corn;—the Weight of Wheat; and the Proportion afforded by it of fine Flour, Bran, and Bread;—the Compoſition and ſubſequent Management of Bread.—Methods of preſerving Yeaſt, and making Leven to anſwer the ends of it;—and the Means of procuring good Bread from other cheap Ingredients where Corn is wanting.*

THERE are ſeveral of the domeſtic arts, which, though conſtantly practiſed, are yet far from being perfectly underſtood in general.—Among theſe we ſhall ſcarcely find any, of which this remark holds good more juſtly, than that of making bread. Simple as the practice of this may ſeem, it is very frequently ill performed with us, through ignorance, even where no other diſadvantages attend: and where the uſual ingredients are not to be obtained, or only at a dear rate, a diſtreſs of courſe follows among the more indigent part of the people. Such a ſhare of information, nevertheleſs, as may be imparted in a ſmall compaſs, would remove the inconveniencies reſulting in either of theſe caſes; and enable thoſe, who have it in their power,

to procure the common ingredients conſtantly, to make good bread of them; or thoſe, who have not, to ſupply their place by ſubſtitutes, that will perfectly well anſwer the end, as to any material points.

In London, nearly the whole of the bread conſumed, is had from bakers; and, in other populous towns, it may be obtained of them by thoſe who cannot make it. The quantity of malt-liquor, brewed in ſuch places, renders it generally practicable to procure yeaſt: and the rates of labour enables the common people to purchaſe bread. But, in many country-places, families muſt ſupply themſelves with the bread they eat; and, if they are ignorant of the right manner of making it, they muſt fail of ſuch as is good:—freſh yeaſt, in ſome parts of the year is ſcarcely to be got on any conditions:—and, in caſes of great ſcarcity of corn, the poorer people are not able to purchaſe a ſufficiency for themſelves and families. All theſe inconveniencies admit of remedy or prevention by means of due reſpective knowledge. Bread may be always made good by methods, which are eaſily practiſed when underſtood:—the want of yeaſt, at particular ſeaſons of the year may be prevented, by knowing how to preſerve it, and lay up a ſtock while it is plentiful; or to prepare ſubſtitutes at all times, that will anſwer the purpoſe of it:—and there are other vegetable products, beſides corn, from

which the common people, when they are apprized of the manner, may obtain bread equally good, either as to flavour or wholeſome nutriment; and which, at the deareſt times of corn, may be procured at ſuch ſmall expence as renders the bread made of them much cheaper than that of corn ever can be, even when the price of grain is at the loweſt.

As to the introducing new kinds of bread inſtead of that made of corn, there is, indeed, ſome difficulty, from the prejudice which the generality of mankind ever entertain in favour of matters to which they are habituated; and this is, perhaps, ſtronger in our common people than in any other.—The preſent affluence in our country has introduced very luxurious notions with reſpect to bread in the lower claſs; eſpecially in places of trade and manufacture. The poorer ſort in London ſcorn any bread but what is made of the fineſt wheaten flour. Though the ſifting it ſo fine occaſions a great waſte of the nutritive part of the grain; and has no advantage, but the ſuppoſed elegance of appearance, over the bread made of flour leſs finely ſifted. As is evident from the preference given by many of the ſuperior people to what is called brown bread; which is by them eaten as a dainty. In fact, nevertheleſs, the whole choice of the kind of bread depends moſtly on fancy, and habit. For on

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the continent ſome ſorts are eaten, and would there be preferred to our fineſt, which the common people here would ſooner ſtarve than touch, even when pinched with hunger. The coarſe ſour bread, made of rye, called pompanichel, baked in large loaves, and kept ſeveral months till it be almoſt as hard as wood, is eaten, and liked by the boors in a great part of Germany. In the moſt northern parts of Europe, bread made of the bark of pine and fir-trees, and ſometimes of the birch-trees, is the common food of the peaſants. It is made of the bark of theſe trees dried in ovens; ground afterwards to a kind of meal; mixt with a proportion of the meal of ſome kind of corn, moſtly of oats; and then made, with water, into paſte, which is ſuffered to ſtand a while to leven, and then formed into loaves and baked. Both theſe kinds of bread are agreeable to the inhabitants of the places where they are in uſe: but would be, to the laſt degree, diſguſtful here. Our people, like wiſe, in ſome parts of Great Britain, where they are accuſtomed to it, prefer, to the ſweeteſt wheaten-bread, oaten-cakes leavened, and baked on a ſtone: which begin to acquire a ſour flavour in leſs than four-and-twenty hours; and yet are often kept for a fortnight, or longer.

But, notwithſtanding the choice of bread is ſo much determined by habit and fancy,

yet

yet the people are not ſo be eaſily led away from their confirmed likings, even for the alleviating the diſtreſs which reſults from great ſcarcity. Luxuries, when eſtabliſhed, become neceſſary to the imagination, and the people feel themſelves miſerable when they find themſelves deprived of them. They will ſubmit to very great hardſhips rather than adopt what is contrary to their reigning taſte. The only means, therefore, to prevent the miſchiefs, which may ariſe from the want of any thing in habitual uſe, is to ſecure as far as poſſible the plenty of it; or, when that may fail, to ſupply ſome ſubſtitute which may differ very little from it.

It is with a view to remove, in all caſes, theſe ſeveral above-ſpecified cauſes of procuring ſuch bread as may ſupply the generality, that theſe obſervations are preſented to the public. Though they may be needleſs to many, who have no want of information on theſe points; yet to thoſe, who have, they may be of great ſervice: and there are few ſubjects of communication that have not the ſame limits as to the extenſiveneſs of their utility.—The domeſtic arts which furniſh the neceſſaries of life ought to be as univerſally underſtood to perfection, as practiſed: and whatever conduces to the general diffuſion of knowledge ſo important has, in a great degree, the ſame conſequence as inventive improvements.

The firſt ſtep towards the procuring good bread, is the making choice of good corn where it may be had.—In order to this, it is requiſite to be able to diſtinguiſh the ſound and perfect from the bad. In diſtinguiſhing good corn by ſight, regard muſt be had to the following ſigns.—That the grains be plump and hard;—of a like ſhape to each other;—and free from diſcoloured ſpots or a duſky blackneſs.

The want of hardneſs and plumpneſs indicates, that the corn was either not perfectly ripe, or reaped and got in with too much moiſture: whence it is either found ſoft, till dry; or, the ſize of the grain contracting afterwards, the outward coat or ſkin appears ſhriveled. Such corn will not yield a large product of flour: nor will what it does afford be perfectly good, but ſubject to grow muſty and be depraved on keeping. The corn raiſed in our country is, in wet and cold ſummers, more liable to this fault than that cultivated in more ſouthern climates. The French know this ſo well, that when corn is not plentiful with them, they have frequently taken quantities of us for their home-conſumption; and ſent what they have reaped in their ſouthern provinces to their Weſt-Indian iſlands, which they ſupply in part with flour.

The diſſimilar or irregular form of the grains of corn, as well as the diſcoloured ſpots

ſpots or ſpecks, manifeſt ſome diſeaſe; and render the quantities under examination, in which they are found, ſuſpicious, in proportion as ſuch grains abound in them. The particular appearance of each kind of diſeaſed grain has been before ſpecified in Article XI. of this volume; and may be eaſily learnt there.

The duſky blackneſs appearing on the outſide of the corn, which ſhews it to be ſmutted, is the ſtrongeſt, as well as plaineſt reaſon, for rejecting it, where ſound corn can be had. But it is requiſite, at preſent, to be further careful in guarding againſt ſmutted corn than merely to judge by a ſlight inſpection. For there are various means of art now diſcovered of freeing it from this exterior blackneſs, while a great part of the diſeaſed grains yet remain. This blackneſs reſults from the kind of ſmut deſcribed, page 171 under the name of *Il carbonne*, or bag-ſmut. It is, originally, within the coat of the diſeaſed grains: but as they are broken in the threſhing, it is diffuſed over the outſide of any of the reſt which come in contact with it. At the ſame time a conſiderable quantity of the bad grains remain unbroken, and conceal within them a proportion of the like black powder. Various means have been diſcovered of taking off this exterior powder without the uſe of water; and rendering the corn clean and good to the eyes,

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on a general inſpection, though all the unbroken ſmutted grains continue in it. To detect this, when practiſed with a view of paſſing ſuch corn for good, it is proper to bruiſe a ſmall quantity: and the blackneſs will, of courſe, ſhew itſelf by the burſting of the diſeaſed grains. The corn, may, nevertheleſs, be freed in a conſiderable degree, from the ſmutted grains by the uſe of ſtrong brine, on treating it as is practiſed for ſeed-corn, according to what has been explained in Article XI: as the grains will be buoyant in the brine; and may be ſkimmed off while floating on the ſurface of it. This may be performed without much expence or difficulty, where there is a neceſſity of making bread of ſmutted corn. But the corn muſt not be ſuffered to remain ſoaking in the brine, as when it is intended for ſeed, longer than while the bad grains can be ſkimmed off: and then it ſhould be immediately taken out; waſhed well with freſh water; and afterwards kiln-dried. Smutted corn may thus be rendered tolerably good for common uſe: but the kiln-drying injures the colour ſo much as to render it exceptionable at the market. There are, nevertheleſs, caſes, in times of great ſcarcity, where the uſe of this expedient may be of material convenience to particulars.

The moſt certain method of diſtinguiſhing good corn, is by weight: rejecting, when

there is opportunity of choice, ſuch as is ſoft, or does not appear perfectly dry.——The mean weight of ſound wheat has, by very accurate trials, been found to be nearly ſixty-two pounds, market-meaſure; or ſixty and one half, ſtandard-meaſure. As ſound corn does not, therefore, ſometimes weigh ſo much, no quantity under examination ought to be condemned, if it be not more than three or four pounds defective in the buſhel, provided no other ſigns of faultineſs be found in it.—But, in proportion as it exceeds, or falls ſhort of ſixty-two pounds per buſhel, market-meaſure, it may be deemed better or worſe.—If to the due weight, conſequently, plumpneſs, hardneſs, regularity of figure in the grains, and a clear equal colour without ſpots or duſky blackneſs be added, the corn may certainly be deemed good.

The produce of a buſhel of wheat weighing ſixty-two pounds, in meal, when it is ground, ſhould be nearly about fifty-nine pounds four *ounces*: and ſo in proportion, when the original weight is greater or leſs.—This meal if it be ground with good French ſtones, and be ſifted of a moderate degree of fineneſs, in the common way, will afford about *forty-five pounds and a half* of FLOUR, and *twelve pounds and a half* of BRAN. But there are boulting machines, (of which there is a model of one kind, on a very good conſtruction, in the collection of the *Society for*

for the Encouragement of Arts, Manufactures, and Commerce,) which will ſeparate the flour from the bran without any loſs in the operation.—The degree of fineneſs here ſtated in the flour is ſufficient for making good houſhold white bread. But there is flour finer in ſeveral degrees, prepared for the London-market, particularly the kind called the Hertfordſhire-whites: which is uſed either alone, or mixt with the common kind, where it is deſired to have the bread very white, without having recourſe to condemnable arts.—The proportion of flour, and bran, even in ſound corn, ground and ſifted exactly in the ſame manner, will, however, vary conſiderably. For the difference of the thickneſs of the coat, or huſk, which forms the bran, as well as the tenacity of the inward or farinous part, will vary, according to the ſeaſon, ſoil, and kind of the ſeed.—The above-ſtated proportion was, however, found to hold good, on actual trial, in corn weighing ſixty-two pounds the market-buſhel, and ground with good ſtones.

With relation to grinding corn, there is one thing very proper to be touched on here.—Great complaints have been frequently made of the adulteration of meal, or flour, when purchaſed of dealers, or ground at public mills; and, alſo, of the abuſes by bakers; particularly when corn is very dear. There

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are, likewiſe, many places in the Britiſh dominions, which lie out of the reach of public mills.—It has, therefore, been thought a very deſirable matter, in order to avoid all frauds at the mill, and to be certain of having bread free from any mixture with exceptionable ingredients; as well as to be able to grind corn by domeſtic aſſiſtance, where there are no public mills; to procure a conſtruction for an effectual mill for grinding corn by hand.—The Society for the Encouragement of Arts, &c. accordingly took up this object ſome years ago; and offered premiums, as mentioned in the hiſtory of their procedings, given in the *Firſt Volume* of this work, for the invention of a good hand-mill. They had not then the ſucceſs to bring this matter to perfection; though there were a number of candidates. But, ſince that time, ſuch improvements have been made on the conſtructions then produced, as have more nearly completed their views: and there are now two different kinds of hand-mills invented, (of each of which, there is one in the Society's collection of machines) that anſwer the purpoſe moderately well.—Both theſe kinds of mills are formed of ſteel: experience having ſhewn, that ſmall ſtones, ſuch as can be wrought by the hand, cannot be made to act with ſufficient power to grind corn with great

fineneſs

fineneſs and equality. The one of theſe is made and ſold by Mr. Peter Lyon of Black-man-ſtreet, at the price of three guineas; the other by Mr. Freeth of Birmingham, at the price of five guineas. The latter will laſt with little or no repair for twenty years; and may then, at a ſmall expence, be rendered as good as at firſt. It grinds a buſhel of corn in a ſhort ſpace of time with moderate labour, that may be performed by a ſtrong boy; and the flour is good: not ſo much greaſed, as is generally found in other conſtructions of ſteel hand-mills.

In the making of bread, even ſuch as may be deemed good, there is, of courſe, a conſiderable variation in the method, ariſing from the cuſtom of different places, the taſte of particular perſons, and the arts employed by bakers to make the loaves appear large and white at the leaſt expence.—The greedineſs of grain, has likewiſe, introduced ſome practices among bakers, particularly in London, when yeaſt and flour have been dear, that rendered the bread leſs ſweet and palatable; and, perhaps, leſs wholſome. But this has been much exaggerated in the accounts given of it by writers.—It is not within the view of theſe obſervations, to enter more minutely into a diſcuſſion of all the means of adulteration of bread: and I ſhall, therefore, confine myſelf to the explanation of the methods of making bread of ingredients that may be deemed genuine.

The method, which is moſt ſimple, and approved by experience, for making good white bread for houſhold purpoſes in the leaſt expenſive manner, is as follows:

		lb.	oz.
Take of fine flour		6	-
——— water two pints and a half	in weight	2	8
——— yeaſt		-	4
——— ſalt		-	2

Let the water be made warm, but not boiling hot, and then let a part of it be put into a veſſel with the yeaſt; which ſhould be well mixt with it by beating them together with a whiſk. Let the ſalt be put into the other part of the water; and ſtirred in it till it be diſſolved. Afterwards put both the quanties of fluid gradually to the flour; and knead the maſs well till the whole be perfectly mixt. Let the dough, thus made, ſtand for about four or five hours; and then form it into the figure of a loaf: which muſt be ſet immediately into the oven, and baked.

In giving the proportion of the ingredients of bread, I have fixed on the quantity of flour which will make the largeſt loaf, that is convenient for baking: and which is nearly about that of thoſe, which are ſold for a ſhilling in country-markets, when corn is cheap. But where, as is more uſual, a greater quantity

quantity of bread is made together, the quantity of the ingredients may be augmented in the ſame proportion, without the leaſt difficulty in the calculation.

Where yeaſt is very ſcarce, a leſs proportion of it may be uſed. But a leven muſt be then made of it, by mixing it with the whole of the water rendered warm, and as much flour as will bring the mixture to the conſiſtence of a thick ſyrup: which muſt ſtand ſome hours, fewer or more, according to the defect in the quantity of the yeaſt. This leven muſt then be uſed in the place of ſimple yeaſt, as above directed.—The bread made with ſuch leven, unleſs other ingredients be added, is not ſo good as that made with yeaſt only. It is leſs tough when new; loſes its ſweetneſs on the keeping; and, in a ſhort time, grows dry and crumbly. It is partly to the uſe of this method, in a greater degree, that the London-bread has theſe qualities, and that ſourneſs in the taſte; which is frequently aſcribed to alum, where none has been uſed. But the fact is, the bakers make a leven, as here mentioned, with a ſparing proportion of yeaſt. They mix it about four in the afternoon; and let it ſtand to ferment till eleven at night. They then form the dough; and let it ſtand to riſe, till the oven be ready for baking it: which is managed to be at four in the morning.

When yeaſt is uſed that is not clean, and free from the ſeeds of hops, or other impurities, it is uſually paſſed through a hair-ſieve, after being mixt with the water. But, where the yeaſt is pure, this practice is a diſadvantage: as part of the body of it will remain in the ſieve.

One of the greateſt difficulties, which is found in making bread, by thoſe who are not accuſtomed to it, lies in the baking it properly: which does not admit of rules, that can be applied with certainty; but depends moſtly on experience. Some hints may, however, aſſiſt to the obtaining ſooner to a ſpeedy ſkill in it.—The firſt point to be obſerved in baking bread, is to make the oven as hot as may be without danger of burning the cruſt, or hardening it beyond the proper degree. It may be known when the oven will burn the bread, by the putting into it any vegetable matter: which if turned black, gives an indication that the heat is too great: and the oven ſhould be ſuffered to cool till it be ſomewhat under this degree.—The next point is to keep the mouth of the oven well cloſed till the bread have riſen to its full height.—The laſt is, to determine when the bread is ſufficiently baked. It requires ſome experience of the oven itſelf to judge of this in practice, by the time of the baking. But thoſe, who are curious, may know it, on particular occaſions by the weight of the loaf.

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—When the dough, according to the quantity of ingredients above ſtated, is *eight pounds fourteen ounces*, it ſhould looſe when enough baked, about *one pound, two ounces:* which will reduce it to ſeven pounds twelve ounces. This is a criterion that cannot fail, when the oven is of due heat, to determine when the bread is ſufficiently baked. But the taking the loaves out of the oven to weigh them is too troubleſome for practice: and the time of their ſtaying there, in proportion to their magnitude, muſt be the rule to judge by, at leaſt with the aid of occaſional inſpection.

Where there are no ovens of public bakers within convenient reach, it becomes improtant to have thoſe which are made for private uſe, ſuch as may be employed moſt eaſily, and with leaſt expence. A portable oven, formed wholly iron, has been invented for this reaſon by Mr. Clement of Maiden-head-court, Gundock, Wappin, and is ſold by him at the price of five guineas. One of theſe ovens was produced to the Society for the Encouragement of Arts, &c. and is now in their repoſitory of machines and models. On examination of it by proper trials, they gave their approbation, and a bounty to the inventor.—This kind of oven is propoſed to have the following advantages: That, admitting of being heated with pit-coal, and even very effectually with cinders or coak, of either of which it conſumes only a ſmall quantity, a conſiderable ſaving is made in the

expence of fuel: — that it may be quickly brought to a proper heat; which may be eaſily regulated and continued of the degree required: and that it may be uſed in any place where there is a common chimney; or where a ſmall vent can be made through the ſides or top of the building. — There are many caſes, in which the uſe of ſuch ovens may be very deſireable, as well for baking other things, as bread; and it ſeems to be particularly accommodated to the ſervice of ſhips.

By a due attention to the particulars above explained, and a little experience in the practice of them, good bread may be always obtained when corn and yeaſt are to be had. But as there are many caſes, where a total want, or a ſcarcity, may render one or both of them impracticable, or difficult to be procured, it is very material to know the moſt effectual means of preventing ſuch want; or of providing ſubſtitutes that may beſt ſupply their place.

In moſt parts of Great-Britain, difficulties frequently attend the procuring YEAST, even in ſmaller quantities, at certain ſeaſons of the year, when, nevertheleſs, at others, that is, during the time of general brewing, it is ſufficiently plentiful. *Preſerving* it in ſuch a manner, that a ſtock may be laid up in the time of plenty, againſt the ſeaſon wherein it is ſcarce, becomes thence a matter of great expedi-

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ence; and is eaſily practicable.—The method of doing of this, is, by *drying* the yeaſt: which will render it capable of being kept for a long ſpace of time without loſing its fermentable property.—The drying yeaſt is performed in the moſt ſimple manner: and the only difference in the methods uſed for that end, conſiſts in the choice of utenſils, or veſſels, employed for ſuch purpoſe.—Where only ſmaller quantities are required, a whiſk or rod of twigs is uſed. This is dipt in the yeaſt, put in a veſſel which is deep in proportion to its content; and then hung up till it be dry. The ſame operation is again repeated till the whole of the yeaſt be taken up; and reduced to a dry maſs, adhering to the whiſk: —which is then to be kept in this ſtate, in ſome proper veſſel, till it be wanted for uſe. —Where greater quantities of yeaſt are required to be preſerved, the moſt convenient method is, to fill a large wooden bowl with it; and to place the bowl ſo filled in a gentle heat before the fire, till it grow dry. A cruſt of the yeaſt will then be formed againſt the ſides of the bowl: and the cavity muſt be again filled up, and the drying performed as before. The ſame muſt be repeated till the bowl be full with the dried yeaſt: which ſhould be then cloſe covered; and kept from moiſture till there be occaſion for any part of it.

When the yeaſt, preſerved as above, is wanted for uſe, ſome part of it muſt be cut off the maſs on the whiſk, or in the bowl; and bruiſed till it be divided into ſmall parts. Warm water being added to it, in a proper veſſel, they muſt be well beaten together; and ſuffered to ſtand two or three hours, when the mixture will gain the appearance and qualities of new yeaſt; and be fit for all the ſame purpoſes.

This method of preſerving yeaſt is very advantageous where inconveniences ariſe from the ſcarcity of it at particular times of the year, notwithſtanding its being plentiful in the other: and, alſo, for ſupplying diſtant places with it, where it could not, otherwiſe, be procured at any time, without ſome troubleſome operations, not eaſily managed.

In places, where no yeaſt can be commonly obtained for the making bread, a leven muſt be uſed inſtead of it. There is a neceſſity for this practice in the colonies, and many other places, where yeaſt cannot be had at any time, unleſs procured by extraordinary and troubleſome means. Good bread may be, nevertheleſs, made in ſuch places without yeaſt: and, indeed, the bread in ſome of the provinces of France, where it is ſaid to be the moſt excellent in the world, has no yeaſt in its compoſition: but there are other ingredients as well as the leven added to the flour,

flour, to procure the due lightneſs, and the other admired qualities.

The leven proper to be employed, as a ſubſtitute for yeaſt, in making bread, may be prepared and uſed by the directions in the following recipe; which is according to the method practiſed in Jamaica, and many other places where yeaſt is not to be eaſily procured. It was communicated to the *Society for the Encouragement of Arts*, &c. by a gentleman, who was well acquainted with the practice of it, in conſequence of an opinion advanced in the Society, that the rendering the knowledge of an effectual ſubſtitute for yeaſt more general, might be of utility to the public.

"Procure from any baker a piece of "dough, having yeaſt in it, ſuch as is made "for bread; and, having let it go through "a ſtate of fermentation, divide it into "pieces, as large as turkeys eggs:—or, "if ſuch dough cannot conveniently be had, "mix ſome flour and water together, to the "conſiſtence of pap; and ſet it by in a "warm place. In the courſe of two or three "days it will ferment: when add as much "flour to it as will make it of the conſiſt-"ence of common ſoft putty, or dough; and "divide it into pieces as above.—Set theſe "pieces, either of the baker's dough, or that "prepared in this manner, in a warm place; "and they will ſwell, and go through a ſe-

"cond

" cond fermentation: after which, they will " fall and flatten. Let them then be kept " dry; and rather in a moderate warm " place: which will harden them; and " preſerve them ſound, and free from any " muſty ſmell. They will not, when thus " treated, be unfit for uſe a month after: " although they may be uſed the day ſuc- " ceeding that, in which they went through " the ſecond fermentation. This prepara- " tion is then called LEVEN.

" When bread is to be made, the propor- " tion of the leven uſed muſt be according to " the quantity; and every other part of the " proceſs muſt be alſo correſpondently regu- " lated in the following manner:

" If ſixteen pounds of flour be required to " be made into bread, take two of the pieces " of leven, which, if dry, muſt be pounded " pretty ſmall; and mix them thoroughly with " about two gallons of luke-warm water. " Then add to the mixture four pounds of " the flour; which ſhould be previouſly " paſſed through a ſieve, to free it from " lumps; and let it then be very well mixt, " and beaten up with the hand, or a paddle. " This mixture, for the reaſons hereafter gi- " ven, ſhould be of the conſiſtence of paſte; " and this regulates the preciſe quantity of " water uſed. So that, if two gallons be not " enough, more ſhould be ſuperadded; but " it muſt be ſtill warm as the firſt. This

" mixture

" mixture ſhould be performed in a large " pan, pail, or trough, that will contain " at leaſt three times the quantity of the in- " gredients: which ſhould there be placed, if " the ſeaſon be cold, in a moderately warm " ſituation.

" In conſequence of this, if the mixture " be not diſturbed, in ſome ſpace of time be- " tween eight or twelve hours, it will fer- " ment to its proper height. This is then " called FERMENT.

" The great art in making bread this way, " lies, however, in knowing when this fer- " mentation is raiſed to its full height. For, " by uſing the ferment at the proper time, the " bread made from it will be rendered light, " ſpongy, and ſavoury; but, if it be taken " any conſiderable time before it arrives to " that height, the bread will be heavy, and " doughy; and if too long after, it will ac- " quire a ſouriſh taſte: ſo that there is requir- " ed ſome little degree of attention, in this " part of the work, until the perſon making " the bread gains ſo much experience, as to " know at ſight the due degree of fer- " mentation.

" This ferment is to be added to the other " twelve pounds of flour, ſifted as before: " and the mixture muſt be kneaded up very " well: in doing which, too much pains " cannot be beſtowed. For, according to " the conſiſtence of the dough, thus made,

" the bread will be more or leſs ſpongy.
" Some people add, at this time, a little com-
" mon ſalt to the dough, to render the bread
" more ſavoury.

" N. B. The ferment uſed ſhould be
" made with juſt ſo much water, as not to
" require any additional ſupply, after the
" flour is added, to bring it to the proper
" conſiſtence for bread: which ſhould be,
" that of common ſoft putty. There-
" fore, thoſe who are a little uſed to the
" proceſs, according to the quantity of
" bread to be made, will regulate the
" quantity of water in the ferment. For
" bread never comes out ſo light and
" ſpongy when plain water is added at
" this time; however, if any ſhould be
" wanted, always let it be uſed warm.

" The dough prepared, as above, is then
" to be divided into loaves, without loſs of
" time, according to the pleaſure of the per-
" ſon making the bread: who muſt always
" remember to reſerve ſome little part of
" it, in the manner firſt deſcribed, to keep
" for leven, till wanted the next time:
" which, together with the loaves, ſhould be
" be put upon a table lightly ſtrewed with
" flour, to prevent their ſticking; and ſet in
" a moderate warm place covered from the
" air, for them to ferment again. When the
" dough has ſwelled, and is riſen to its full

" height

" height, which will be in three or four " hours; it is then to be put into the oven: " and the mouth of the oven ſhould be " cloſely ſtopt for two or three hours: in " which time the bread will riſe to its full " height. After this, the opening, or ſhutting " the oven, it is to be regulated according " to the occaſion, that the bread may not be " burnt, or become too cruſty.

" N. B. If the mouth of the oven be " not very cloſely ſtopt, at the firſt put- " ing in the bread, it will flatten, and not " be ſo light, as it would otherwiſe " be."

The moſt important defect of the ingredients for making bread ariſes from the want, or ſcarcity of corn. It not only brings diſtreſs on the poorer people; but frequently riotous irregularities, and diſorders, productive of great miſchief.

In caſes of ſuch ſcarcity, ſome kinds of eſculent, or garden, roots may, indeed, generally be obtained; and would anſwer the end of bread with leſs expence than that can be purchaſed for at the cheapeſt times. But, as was before obſerved, the people will never be ſatisfied by any other than their cuſtomary mode of diet: and it is, therefore, of conſequence to ſhew, how thoſe roots may, with the addition of ſome proportion of corn, be formed into bread, which will come

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very near in all its qualities to that made wholly of corn.

The root, which will afford the moſt excellent bread, either for taſte or wholeſomeneſs, is the POTATOE. It is happily, at preſent, the cheapeſt of thoſe fit for this purpoſe: and, by further improvements in the culture; and the introduction of the new, or conglomerate kind, (of which an account is given in a ſucceeding article) there is great reaſon to hope it will ſoon be much cheaper.—The bread made of potatoes, mixed with ſome proportion of wheaten flour, reſembles that wholly made of wheat, ſo as ſcarcely to be diſtinguiſhed by perſons not appriſed beforehand of the compoſition. It differs only from the wheaten bread in being ſomewhat ſweeter and moiſter: which qualities it retains on keeping, ſo as not to appear ſo ſtale, or be near ſo crumbly after two or three days as the other.—A recipe for bread of this kind was given, in a late number of a periodical work, as tranſlated from a foreign publication; but there is no reaſon to conclude, we are obliged to foreigners for the invention of it; as the preparation of ſuch bread has been well known here a conſiderable time: and was imparted to me, ſome years ago, in order to its being made public, by an eminent magiſtrate in Weſtminſter, who is, on all occaſions, zealouſly attentive to promote the public good. The following method

method has been found to produce this bread in perfection, by the moſt eaſy means.

Take any quantity of potatoes; and boil them in water till the ſkins begin to crack. Then peel them, and bruiſe the pulp, till no lumps remain in it. To the pulp, thus prepared, put ſuch a quantity of boiling water as may be judged ſufficient to make the dough for the quantity of bread intended: and, having mixt it well with the pulp, by ſtirring them together, add as much wheaten flour as is equal in weight to one half part of the potatoes, with as much yeaſt, and ſalt mixt with part of the water as may be requiſite, according to the proportion of theſe ingredients above-mentioned in the directions for making wheaten bread. Then knead the whole well together; adding more warm water, if neceſſary, to bring it into dough of the common conſiſtence. Let this dough then ſtand to riſe, in a warm place, or, at leaſt, a covered veſſel; and afterwards, bake it as other bread, but ſomewhat more ſlowly, though to the ſame degree in the end.

The potatoes are beſt bruiſed for this purpoſe on a table or board, with a wooden roller.——The peeling them, and even the boiling, may be omitted where there is not time or opportunity for it. But the potatoes muſt then be raſped, or beaten to pulp in a mortar of wood with a peſtle of the ſame.—Theſe variations make little difference

rence in the taſte, or eſſential qualities of the bread.

Where yeaſt is wanting, a leaven may be made, and employed for this kind of bread in the place of it. This may be prepared, and uſed in the manner above-directed for wheaten bread, with ſome of the flour intended to be added to the potatoes: and a ſmall part of the dough may, alſo, in like manner, be retained for making ſuch leven on a future occaſion: which end it will equally well anſwer as dough formed wholly of wheaten flour.

Rye or barley flour may, for cheapneſs, be ſubſtituted inſtead of wheaten, in this kind of bread: which will ſtill approach nearer in its qualities to that made of wheat, than if it was wholly formed of theſe kinds of grain.

When corn is dear, and potatoes, alſo, are not to be obtained at a cheap rate, but turneps are at the ſame time plentiful, the latter may be uſed in the place of the former: and a very good bread, of a like kind with the above, may, by that means, be obtained.——The turneps, when applied to this purpoſe, of making bread, are to be pared and boiled till they become ſufficiently ſoft: and the water is then to be preſſed out of them.—The pulp thus obtained, is to be treated, in all reſpects according to the directions above-given for making bread of potatoes.

potatoes. The turnep-bread, thus made, varies in taſte from wheaten bread, rather more than that made of potatoes. But it is only in having a peculiar ſweetiſh flavour; and not that of the raw turnep itſelf. It keeps better than the bread made wholly of wheat, with reſpect to the retaining its moiſture; and does not contract any bad quality.

In times of great ſcarcity of corn, and where potatoes and turneps are, alſo, not to be cheaply had, carrots, parſnips, and Jeruſalem artichokes, may be uſed for the ſame purpoſe of making bread, when they are to be obtained at a low price.—They muſt, in ſuch caſe, be reduced to the ſtate of pulp, by boiling, raſping, or bruiſing; and then uſed in the ſame manner as has been directed for making the bread of potatoes.—They will not produce bread ſo like that made wholly of wheat as potatoes or turneps: but it will, nevertheleſs, be nutritive and wholeſome.

By the ſeveral means above ſpecified good bread may, in all caſes, be obtained, either from corn alone, where it is to be procured in ſufficient plenty; or, from eſculent roots mixt with ſome proportion of the meal of corn, in times of ſcarcity.—Information, regarding any of the reſpective particulars, may be ſaid not to be generally wanted: but, on thoſe occaſions where it may, it is of great private convenience, and, perhaps, public utility, that it ſhould be ſupplied: as individuals frequently labour under very embarraſſing difficulties from the defect of it.

ARTICLE XIV.

Account of the late Introduction of the TRUE *or* PALMATED RHUBARB, *into* Great-Britain; *with Obſervations on the proper Method of cultivating, and curing it, in order to obtain the Roots in a State* officinally *fit for the Purpoſe of Medicine.*

THE importance of RHUBARB, as an article in the *Materia Medica*, is too well known to require any diſcuſſion here.—The dearneſs of this drug, when the beſt is employed, has, nevertheleſs, hitherto confined the freer uſe of it to ſuch perſons only, as can afford the expence of coſtly medicines; and occaſioned the neceſſity of ſubſtituting in general for the common people, drugs that are cheaper, though deemed leſs effectual for the intention.—Conſidered as an article of commerce, rhubarb being obtained from foreigners, with whom the balance of trade lies againſt us, the conſumption of it is, in that light prejudicial to us.—The very great fluctuation in the price of rhubarb, likewiſe, merits ſome regard: for it ſometimes riſes to a moſt exorbitant rate, too high to admit of its uſe, as an alterative medicine, even to perſons of middling fortune: and certain poſſible events might prevent our being able

to procure the beſt kinds, even at any price.

The above enumerated circumſtances render it a deſirable matter, that we ſhould, if practicable, produce rhubarb in our dominions, and even in Great-Britain, if poſſible, in order to make a national ſaving of what we pay for it to foreigners; to have it in ſuch plenty, as may admit of its being adminiſtered as well to the poor as the rich; and to have the certainty of a conſtant ſupply of what is good. Perhaps, if circumſtances prove favourable, we may in time be able even to export part of our own product, inſtead of purchaſing, as now, what we conſume ourſelves.

Induced by theſe conſiderations, about eight years ago, I prevailed on the Society for the Encouragement of Arts, Manufactures, and Commerce, to empower a proper committee to purſue the requiſite meaſures for introducing the culture of the true rhubarb into Great-Britain; or, if that ſhould be found impracticable, into our American colonies.—The firſt neceſſary ſtep to this end was, to aſcertain the kind of this plant, which afforded the beſt ſort of rhubarb, commonly know among dealers by the name of *Turky Rhubarb.* This name had been given to it, becauſe it had originally been imported hither from the Levant. But it was afterwards brought, on the extenſion of

the Eaſt-India trade, from China; as, alſo, in an inferior degree of goodneſs from Ruſſia: and at laſt, on the commercial improvements made in the Ruſſian dominions, the beſt came to us through that channel. Whence it is now called, by ſome, Ruſſia rhubarb. Along with the diſquiſition reſpecting the plant producing the officinal rhubarb, it was, likewiſe, an object of inquiry, whether we had this kind in our botanical collections of living plants: as there were ſeveral there, which different authors, or profeſſed botaniſts, had aſſerted to be the true. In order to clear up theſe points, letters were written not only to ſeveral of the moſt able of our botaniſts, but to an eminent profeſſor abroad, to requeſt, they would communicate what information, they were able, on this head. The reſult of the inquiry was concurrent declarations, that a kind, we then had, was the true plant; and though all who had taken up the roots, and dried them, found them ſhrink, and ſhrivel without attaining the ſolid conſiſtence of good rhubarb, or ſome other of its qualities; yet the reaſon they aſſigned for their not acquiring a perfect ſtate for medicinal uſe, was, according to ſome, that our climate did not bring them to a due maturity; and, to others, that a ſufficient time had not been allowed for their growth, which occaſioned them to be too ſucculent, and ſo want the ligneous texture of good rhubarb.

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In conſequence of theſe dubious circumſtances, an eminent botanical gardener, to whom the plant, moſt imagined to be the true kind, had been originally ſent from abroad, was deſired to raiſe a proper number of the roots, and keep them till they ſhould attain a greater age, that they might then be dried with care; and examined, in order to determine the queſtion reſpecting their being of the genuine kind.—In the mean time, the following incident took place, and anticipated this trial by ſuperſeding the neceſſity of it: as it aſcertained the right kind of rhubarb plant; and put us, at the ſame time, in full poſſeſſion of it.

Doctor Moncy, an Engliſh phyſician, then reſiding in Ruſſia, obtained a quantity of the ſeed of the beſt kind of rhubarb plant from the Royal Academy of Sciences at Saint Peterſburgh; and ſent it to a gentleman in London, who diſtributed the ſame among thoſe of his acquaintance, that were curious in ſuch matters. In conſequence of this, plants were raiſed from the ſeed in various parts of Great-Britain; but rather as a curioſity than with a view to practical uſe. Amongſt others, Doctor Hope of Aberdeen had one plant, which flowered four years ago; and induced him to have a copper-plate engraved after it: and ſome plants were, likewiſe, raiſed in the garden of the Muſæum in London.

It did not appear, however, from any particulars made known to the public, that further ſteps had been taken, to render the introduction of this plant into our country of general uſe and benefit, till about four months ago. At that time, Mr. Engliſh of Hampſtead informed the *Society for the Encouragement of Arts, Manufactures, and Commerce*, by a letter, that he had raiſed a number of plants of this kind of rhubarb: ſome of which were then ſix years old; that he had taken up ſome of the roots, dried them, and had trials made of their efficacy; that he had reaped as much ſeed as would plant a great number of acres; and that finding every appearance favourable to the opinion that good rhubarb could be produced here, he was deſirous to have this ſeed diſperſed, through the means of the Society, into the hands of ſuch as might be deſirous to propagate this plant, and cultivate it in large, with a view to the obtaining the roots for the purpoſes of medicine. He ſent to the Society, along with this letter, a painting of the plant done after nature, a large intire root in the ſtate it was taken up; and part of another root dried; ſome of which was whole, and ſome powdered. — On examination of theſe ſpecimens, and information of certain relative facts, it was found, that ſome of this rhubarb having been adminiſtered, had operated duly, and kindly, as a purge; and that

that the ſcent and colour of the powder were ſimilar to thoſe of good Turky rhubarb. The appearance of the part of the dried root, that was unpowdered, was not equally favourable; but the defect of it was evidently owing to the want of ſkill in the drying, to which Mr. Engliſh was a ſtranger; and perhaps ſomething was to be allowed to want of age in the plant. As there is good authority for believing that the prime rhubarb is not taken up till it be at leaſt ſix or ſeven years old: when its texcure is of courſe more ligneous and ſolid.

The committee, which was attended by ſeveral able botaniſts, and phyſicians, on the ground of this examination, came to the following reſolutions: which, on being reported, were confirmed by the Society.

"That it appears to the committee, the "rhubarb cultivated by Mr. Engliſh is the "true RHEUM PALMATUM: and that, by "experiments made, it is found equal to the "rhubarb imported from Ruſſia, in its ef-"fects as a purge.

"That, it is the opinion of the committee "if this rhubarb be properly cultivated, and "cured in this country, it will be equal to "that commonly called *Turky* rhubarb.

"That the gold medal of the Society be "given to Mr. Engliſh for his care in cul-"tivating the rhubarb plant: and for his offer of preſenting the Society with a

" quantity of ſeed for the uſe of the public."

In purſuance of the laſt reſolution, the ſeed ſent by Mr. Engliſh to the Society was diſtributed among a number of gentlemen, who gave in their names as deſirous of the ſame, in order to its being raiſed and tried in various ſoils.

The Society have ſince come to this further reſolution :—" That the gold medal of " the Society be given to Doctor Moncy, for " promoting the views of the Society, by aſ- " ſiſting to introduce the cultivation of the " true rhubarb into England."—They have, alſo, further reſolved to offer a premium for the propagation of the rhubarb plant in Great-Britain on the following conditions :—

" For raiſing, before the end of the year " 1773, the greateſt number of plants, not leſs " than one hundred, of the *Rheum Palma-* " *tum*, or true rhubarb, a gold medal.

" For the ſecond greateſt number, not leſs " than fifty plants, a ſilver medal.

" Certificates of the number of plants, " that they ſtand at leaſt ſix feet aſunder; " and that they have been in a thriving " ſtate during the preceding ſummer; with " an account of the ſoil, culture, and aſ- " pect; to be produced on, or before the " ſecond Tueſday in January, 1774."

The diſtance required by the Society, for the rhubarb plants to ſtand from each other, may appear ſomewhat extraordinary. But

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they eſtabliſhed this condition, on having ground to believe, after due deliberation, that, conſidering the largeneſs of the tufts, and the great compaſs the leaves ſpread, before the roots are of a due age to be taken up, leſs room would not ſuffice for the plant to acquire its full ſtate of perfection.

In order to facilitate, and render more effectual the endeavours of the Society, to eſtabliſh the production of the true rhubarb in this country for uſe, it may be very proper to give the public the beſt information, which can be procured, of the natural and commercial hiſtory of the plant; and of what other lights may be at preſent obtained to lead us into a right method of cultivating it here; and curing the roots in ſuch manner, as may make them ſimilar, as well in their appearance, as medicinal qualities to the beſt Turky rhubarb.

This kind of rhubarb is called, by Linneus, who is the firſt that has placed it in any general liſt of plants, the RHEUM PALMATUM: which name he gave it on account of the palmated form of the leaves.

From their total ſilence about it, we muſt conclude this plant was unknown to Tournefort, and the other former writers of botanical ſyſtems, who appear to have been ignorant of any other kind of rhubarb but thoſe with *dock-leaves*, either of a more round or longer and pointed form. This ignorance

ignorance may be well aſcribed to the little communication, the weſtern Europeans had, till lately, with the countries where the palmated rhubarb naturally grows; and to the little obſervation which travellers in general paid to the minuter facts of natural hiſtory.

The roots of this rhubarb are large; and branching, near the crown, into very thick ramifications. Their coat is of a browniſh yellow colour, before it be dried; and the root itſelf a darker yellow within. One of thoſe which Mr. Engliſh raiſed and took up, when ſix years old, weighed fourteen pounds; but it may be preſumed that, at a greater age, it would have increaſed to twenty. They are, when of due age of a woody nature; and when dried of a firm hard ſubſtance, the colour of which is a mixture of brown and pale yellow, marbled like a nutmeg.—The leaves are large near the ground, but ſmaller on the upper part of the ſtalks. They are divided into ſeveral unequal parts, ſtanding ſeparate at ſome little diſtance from each other, but uniting in one intire middle part; from which form, ſeeming to have ſome reſemblance to a hand, this kind of leaf is called *palmated*. They are of a dark green colour; and put out here in March, or the beginning of April. —From the root, ariſe a number of the main ſtalks, which branch almoſt their whole length

length into others ſmaller. Thoſe of the plants in Mr. Engliſh's garden, roſe, in the ſixth year, to ten or eleven feet height; but at a more advanced age it is probable they will be much higher.—On the branching ſtalks, grow ſmall white flowers in tufts: which leave ſeeds like thoſe of the common dock, but bigger.—I ſhall wave giving here the botanical characters of claſſification of this plant: as thoſe of the rhubarb are well known to all who are verſed in that part of botany: and by ſuch as are not, this kind may be eaſily diſtinguiſhed from all other plants by the deſcription of the more obvious appearances here given.

This plant, from its magnitude and height, ſingular look of its leaves, and numerous tufts of its white flowers, has a very ſtriking and beautiful appearance; and, beſides its utility in medicine, is an acquiſition to the modern garden as a capital ornament. It is found native in the whole range of the Tartarian countries lying in the degrees of latitude from forty to forty-eight, from the banks of the Volga, and the Caſpian ſea to China and Corea. The true rhubarb ſeems, however, much more rare in the weſtern part of this vaſt track than in the eaſtern. For though we have had ſeveral of the dock-leaved kinds brought to our part of Europe from the countries adjacent to the Volga; yet we never had this

palmated

palmated kind before: notwithſtanding the reſearches made by Tournefort, and many others after the true rhubarb. Nor have the numerous travellers or writers, who have viſited or given accounts of the weſtern countries of Tartary, hinted, that they had the leaſt knowledge of a kind of rhubarb with palmated leaves: whereas in the Mungal Tartary, and the eaſtern countries of the Calmucks, particularly near the banks of the Irtiſh, it is ſo frequent, that it can ſcarcely eſcape the notice of a traveller, who is not totally devoid of obſervation. It is certain, however, on compariſon of the roots, of the palmated, when dried, with thoſe of the dock-leaved kinds, that all the rhubarb, which has paſſed under the name of Turky rhubarb, was afforded by this plant; though it has been brought to us, at different times, by different routes, according to the revolutions, which have happened in the commerce of the Eaſt, and our concerns in it.

In the earlier times, when the whole of our trade with the inland countries of the Eaſt was carried on through the Levant, all the good rhubarb, brought to us, came from the ports of Turky. On the eſtabliſhing a commerce immediately with the maritime parts of the Eaſt, particularly China, and opening a trade with Ruſſia, in-

ferior

ſerior kinds of this drug were obtained from thoſe countries; and, in diſtinction to ſuch inferior kinds, the beſt was then called Turky rhubarb. Since that time, on the ſtop being put, juſt before the death of the great Czar Peter, to the caravans, which had for ſome time been permitted to go once in three years from St. Peterſburgh to Pekin in China, Tobolſki, the capital of Siberia, which lay in the mid-way of that route, became a very great emporeum or mart to the inland parts of the Eaſt. By this revolution in commerce, a conſiderable quantity of the beſt rhubarb, as well as that collected by the Mungals, and eaſtern Calmucks, and ſent into China, as that collected by the weſtern Calmucks and ſent into Turky, was carried to Tobolſki, and purchaſed by the Ruſſian merchants; who, conveying it to Peterſburgh, furniſhed the opportunity of our being ſupplied with it thence. It is, however, ſufficiently clear from evident facts, that the inferior parcels of rhubarb brought hither from China and Ruſſia, are, in reality, the roots of the palmated kind, as well as the good; but owe their inferiority in quality to their being taken up promiſcuouſly without a proper regard to their age (whence, ſeven or eight years being required, the greateſt part will be too young); or to their not being dried with due ſkill and care. For, among the parcels of this inferior kind, ſome

pieces

pieces are frequently found, which are perfectly good, and reſembling the Turky: but when the parcels paſs the hands of judicious dealers, the more perfect are picked out before they come to us; and ſold at different rates from the worſe.

It is very remarkable, that the travellers, who have viſited and given deſcriptions of the many countries in the vaſt tract of Aſia, where the true rhubarb may be found, have in general been ſo ſilent as to the hiſtory of that plant: notwithſtanding the importance of its root as a drug, and the ſingularity of its appearance for magnitude and beauty. Mr. Bell, a Scottiſh gentleman, who publiſhed a narrative of his journey from Saint Peterſburgh to Pekin with a Ruſſian embaſſy, has furniſhed the beſt, or indeed only authentic, account we have of it. But he has omitted any deſcription of the plant itſelf, and even the ſingularity of the form of its leaves. As his veracity, however, can be well depended on, and what he has advanced is moſtly what he ſaw himſelf, his relation of thoſe particulars, he did obſerve, may yield ſome lights for our culture of the plant, in order to obtain it in the moſt perfect officinal ſtate: and I will, therefore, inſert the whole he has ſaid on this ſubject, as it lies in a ſmall compaſs.—

The firſt notice Mr. Bell takes of rhubarb, in the narrrative of his journey, is in ſpeaking of the river Irtiſh: which has its ſou[illegible]

ſource from the lake Korzan, in the moſt inland part of Aſia, inhabited by the black Calmucks, where he mentions a very antient building called the *Sedmy Palaty*, or Seven Palaces, yet ſtanding on the banks of this river, in the Calmuck country, conſiderably below its ſource. He there ſays:—"Above "the *Sedmy Palaty*, towards the ſource of "the Irtiſh, upon the hills and valleys, grows "the beſt rhubarb in the world, without "the leaſt culture." This country lies in about forty-three and forty-four degrees of latitude: which is much the ſame with that of the parts of the Mungal Tartary, where, as we ſhall ſee below, the greateſt quantity brought now to the European markets is produced. The rhubarb collected on the Irtiſh, by the Calmucks, was formerly carried to Aſtracan; and from thence to the ports of the Levant: whence we had it among other articles of the Turkiſh trade. But the river Irtiſh paſſing down to Tobolſki; and the Ruſſians having forts for a conſiderable length up its banks, they procure it now by traffic immediately from the Calmucks; as they, alſo, do conſiderable quantities, that are collected further eaſtward from the Mungals.

The next paſſage, where Mr. Bell mentions rhubarb, is in giving an account of the *Urga*, or camp of the Tuſh-du chan, or prince of the Mungal Tartars. He ſays there:—"What they call the *Urga* is the court,

"or

" or the place where the prince and high
" prieſt reſide, who are always encamped
" at no great diſtance from one another.
" They have ſeveral thouſand tents about
" them, which are removed from time to
" time. The Urga is much frequented by
" merchants from China, Ruſſia, and other
" places; and all trade is there carried on
" by barter, without money of any kind.
" The Chineſe bring hither ingots of gold,
" damaſks, and other ſilk and cotton ſtuffs,
" and ſome porcelain, which is generally of
" an inferior quality, and proper for ſuch a
" market. The Ruſſian commodities are
" chiefly furrs of all ſorts. RHUBARB is
" the principal article, which is changed for
" theſe goods; great quantities whereof are
" produced in that country without any
" culture. The Mungals gather, and dry it
" in Autumn; and bring it to this market;
" where it is bought up at any rate, both
" by the Ruſſians, and Chineſe merchants."
It is owing to the opening this immediate communication with the Mungala, as well as the trade with the Calmucks, above-mentioned by the river Irtiſh, that the Ruſſians have had the opportunity of procuring, at very low rates, the greateſt part of the beſt rhubarb: of which, however, ſuch advantages are taken by engroſſing dealers, that it bears now, with us, near as high a price as formerly, when that collected

by the black Calmucks, which was nearly the whole that came to us, was brought by the way of the Levant.

Mr. Bell, in his progreſs of the narrative of his journey, has this further paſſage: in which he more explicitly relates all he obſerved with regard to the rhubarb. What he mentions, paſſed in the part of the Mungal Tartary, that is under the dominion of the emperor of China, after he had travelled four days journey from the river Saratzin, which he makes the boundary, in that part, between the Ruſſian and Chineſe territories."

"In the evening, I walked from our tents, "with ſome of our company, to the top of a "neighbouring hill, where I found many plants "of excellent rhubarb; and, by the help of a "*ſtick*, dug up as much of it as I wanted.

"On theſe hills, are a great number of ani- "mals, called *marmots*, of a browniſh colour: "having feet like a badger; and being nearly "of the ſame ſize. They make deep holes on "the declivities of the hills: and it is ſaid, that, "in winter, they continue in theſe holes for "a certain time even without food. At this "ſeaſon, however, they ſit or lye near their "burrows, keeping a ſtrict watch; and, at "the approach of danger, rear themſelves "upon their hind feet, giving a loud whiſtle "like a man to call in their ſtragglers; and "then drop into their holes in a moment.

" I ſhould not have mentioned an animal
" ſo well known as the marmot, had it not
" been on account of the rhubarb. Where-
" ever you ſee ten or twenty plants growing,
" you are ſure of finding ſeveral burrows
" under the ſhades of their broad-ſpreading
" leaves. Perhaps they may ſometimes eat
" the leaves, or roots of this plant. How-
" ever, it is probable the manure, they leave
" about the roots, contributes not a little to
" its increaſe: and their caſting up the earth
" makes it ſhoot out young buds and mul-
" tiply. This plant does not run and ſpread
" itſelf like docks, and others of the ſame
" ſpecies; but grows in tufts at uncertain
" diſtances: as if the ſeeds had been drop-
" ped with deſign. It appears, that the
" Mungals never accounted it worth culti-
" vating; but that the world is obliged to
" the marmots for the quantities ſcattered
" at random in many parts of the country.
" For whatever part of the ſeed happens to
" be blown among the graſs, can very ſel-
" dom reach the ground; but muſt wither
" and die: whereas, ſhould it fall among
" the looſe earth, thrown up by the mar-
" mots, it immediately takes root, and pro-
" duces a new plant.

" After digging, and gathering the rhu-
" barb, the Mungals cut the large roots in-
" to ſmall pieces, in order to make them
" dry more readily. In the middle of every

" piece,

" piece, they ſcoop a hole, through which a
" cord is drawn, in order to ſuſpend them
" in any convenient place. They hang
" them, for the moſt part, about their tents;
" and ſometimes on the horns of their ſheep.
" This is a moſt pernicious cuſtom, as it de-
" ſtroys ſome of the beſt part of the root.
" For all about the hole is rotten, and uſe-
" leſs. Whereas, were people rightly in-
" formed how to dig up, and dry this plant,
" there would not be one pound of refuſe
" in a hundred: which would ſave a great
" deal of trouble, and expence, that much
" diminiſh the profits on this commodity.
" At preſent, the dealers in this article, think
" theſe improvements not worthy their at-
" tention: as their gains are more conſider-
" able on this than on any other branch of
" trade. Perhaps the government may here-
" after think it proper to make ſome regu-
" lations, with regard to this matter.

" I have been more particular in deſcribing
" the growth and management of the rhu-
" barb: becauſe I never met with an au-
" thor, or perſon who even gives a ſa-
" tisfactory account where or how it grows."
" I am perſuaded, that, in ſuch a climate
" as this, it might eaſily be ſo cultivated
" as to produce any quantity that could be
" wanted."

The particular place where Mr. Bell made theſe obſervations on the growing rhubarb,

in his journey to Pekin, was that where the ambaſſador's train ſtopped to repoſe for the night, in the Mungal Tartary, the day after having croſſed the river Karu; and lies betwixt the forty-ſeventh and forty-eighth degrees of north latitude.—The ſoil of the country is there very rich, according to the account he has given of it, in ſeveral preceding paſſages: and, indeed, it may be certainly inferred to be ſo, from the great rankneſs of the graſs, which he here mentions. It may be, alſo, concluded to be a light loam, from Mr. Bell's having been able to dig up the good part of the rhubarb roots, with the aſſiſtance of a ſtick only: though near the crown, they dip almoſt perpendicularly into the ground. It would not have been practicable by ſuch means to looſen the earth round them, had the ſoil been clayey and ſtrong: as it would have been impoſſible, at leaſt, without great and tedious labour to have penetrated with a ſtick ſo deeply, and widely into ſuch ground, that had never been broken up before.—Mr. Bell ſuppoſed the holes in the rhubarb, made by thoſe who collect it, are only intended to render the hanging it up to dry more convenient. But there is another reaſon for that practice: which is, that by ſcooping out the middle part, the reſt grows dry much more quickly: and by that means an opportunity of diſpoſing of it ſooner at market is obtained. It is, however, a faulty method

method: as the cutting the roots into thinner ſlices would anſwer the ſame purpoſe.

The laſt remark Mr. Bell has given concerning rhubarb, in his relation of this journey, is an obſervation which he made after travelling ſix days in the Mungal Tartary from the place laſt mentioned. When, having croſſed the river Tola, he ſays, "The "appearance of the country was now greatly altered for the worſe. We ſaw no "more pleaſant hills; and woods; neither "could I find a ſingle plant of rhubarb. "The ſoil was dry and barren: and the "graſs not to be compared to what we had "already paſſed over." This fact is a confirmation, that the rhubarb does not naturally grow, but on a rich and fertile ſoil. For on the banks of the Irtiſh, in the Calmuck Tartary, it is found in the greateſt ſtate of perfection, as above-mentioned, in places more to the ſouth than this: and it can be therefore, only owing to the difference of the ſoil, that no roots of this plant are found here, as well as in all the fertile parts of the countries, which ſurround this to the north and weſt.

Having thus ſhewn in what manner, the rhubarb brought to us is produced in the countries where it naturally grows, I ſhall now endeavour to point out the methods, which ſeem moſt proper to be purſued, in the cultivation and curing it in our own

country, in order to the ſupplying ourſelves with what we may have occaſion for.—The reaſons, from whence I conclude, the particular directions, that will be given, to be right, are deduced from the facts, related, as above, to have been obſerved by Mr. Bell; from circumſtances, which have occurred in the promiſing attempt made by Mr. Engliſh to bring the plant to perfection here; and from the practice, which experience has evinced to be good in ſimilar caſes. —— There is, however, ſome difference to be attended to, betwixt what is proper to be done in the *garden-culture* of the rhubarb, when, as is the caſe at preſent with moſt perſons, only a ſparing quantity of ſeed is to be obtained, and the propagation rather than the planting, with a view to great quantities, is the temporary object; and in the *field-culture*, when, as may be the caſe hereafter, the raiſing large quantities with a view to the ſale of the roots may come in queſtion.—I ſhall, therefore, firſt enumerate thoſe particulars, which reſpect the garden-culture; and, afterwards, proceed to thoſe of the field-culture.

In order to the moſt certain ſucceſs, the ſeeds are beſt ſown on a gentle hot-bed prepared in the common manner: as was practiſed by Mr. Engliſh. But there is no occaſion to make a hot-bed on purpoſe, where any

any may remain unbroken up, that has been employed the year before, for raiſing melons, or cucumbers, or for ſuch-like purpoſes. —The time of ſowing, in this caſe, may be, as moſt convenient, from the middle of February to the middle of March. But if the ſeed be ſown ſo early, that the plants riſe before the froſts are over, it would be a prudent caution to cover them, during that time, at nights. In other reſpects, it is more ſafe to raiſe them early than later: as they will of courſe be ſtronger, and more able to reſiſt ſevere weather in the ſucceeding winter.—The ſeed may either be ſprinkled over the beds; and the earth raked over it: or, where there is but a few, they may be ſet ſeparately with a ſmall dibber at about four inches diſtance from each other; and at the depth of about three quarters of an inch.— The uſe of a hot-bed is only to enſure the greater certainty of ſucceſs: becauſe the plants being forwarder, and having ſent their roots deeper into the ground before the ſucceeding winter, they will be better able to reſiſt any extraordinary inclemency of ſeaſon that may come on them. But where there is no convenient means of employing a hot-bed, the ſeed may be ſown towards the end of March in the ſame manner, on any bed of light earth well-ſheltered from the north by a wall, or ſkreen. For there is no danger of their miſcarrying, if no uncom-

mon ſeverity of ſeaſon happen the enſuing winter.

When the plants are come up, they ſhould be kept clear from weeds, and watered ſparingly, if the ſeaſon prove very dry, and they ſeem to droop from the want of moiſture.—Where the ſeeds are ſet with a dibber, at the diſtance above-directed, the plants may be ſuffered to remain in this ſtate till the next ſpring: but where the ſeed is ſown by ſprinkling, as many of the plants ſhould be carefully drawn out at Midſummer, as will leave theſe which remain the ſpace above preſcribed. Thoſe, which are thus drawn out, ſhould be planted on another bed at the ſame diſtances; and ſhaded till it appears, by their leaves ceaſing to droop, that they have taken root. It is moſt ſafe to tranſplant theſe ſeedlings into an old hot-bed: but where that is wanting, a bed of rich light earth, ſheltered as above, will anſwer the end with moderate ſecurity.

In the beginning of March, the year after the ſowing, all theſe plants will be of due ſtrength to be finally tranſplanted into the places, where they are to remain to the time of their full growth.—This tranſplantation may be made either into proper parts of a garden, or any piece of ground ſet a-part for them. But where the roots are intended for medicinal uſe, the place ſhould be airy; free from much wet; and having a ſouthern aſpect, if there be any declivity in the ground.

The

The rhubarb may be propagated by offſets, as well as ſeed: the plants ſending them out pretty freely. At the time of the final tranſplantation of the ſeedlings, they will afford ſome: which may be taken off with due care; and replanted on the bed whence the ſeedlings were taken: where, if they remain till the next ſpring, they will be fit to be planted out in the places where they are intended to grow.—The ſame may be done every ſucceeding year with the older rhubarb plants; and a great increaſe made without ſowing any ſeed. The off-ſets of plants more than one year old will, moreover, be ſtrong enough to be planted where they are to remain, without the trouble of putting them in a nurſery-bed.—It muſt be obſerved, however, as a caution, not to tear too much, or injure the crown of the principal plant in ſeparating the off-ſets. Nor ſhould the older plants be too much deprived of ſhoots: which would impoveriſh the roots; as the forming the reſinous juices, in which their medicinal virtue conſiſts, depends on a due proportion of the herbage.

After the final tranſplantation of the rhubarb plants, nothing more remains to be done, in the garden-culture, than the keeping them free from weeds: except that where the roots are intended for uſe, it would be well, for the firſt two or three years, to looſen the earth in the ſpring near them,

them, for eight or ten inches, taking care not to wound them. But though it will promote their growth, it is not abſolutely neceſſary.

In the cultivation of rhubarb in larger quantities for ſale; or what may be called the *field-culture*; the firſt objects of attention are, the choice of the ground; the preparation of it for receiving the plants; and the procuring a due number of ſeedlings, or off-ſets.

The ſoil, on which rhubarb is cultivated, ſhould be rich, deep, and of a light loamy texture. The richneſs, moreover, ſhould be rather owing to the natural fertility of the earth than to manure. At leaſt, if ground on which manure has been copiouſly put be choſen, it ſhould be ſuch only on which the manure has been ſo long laid as to admit of its being well mellowed and putrified.—As the rhubarb does not require great moiſture, but, on the contrary, ſuffers from it, a moderate riſing or declivity of the ground does not render it unfit for the purpoſe. But, in ſuch caſe, care ſhould be taken, that the aſpect be to the ſouth: as that is abſolutely requiſite to the perfection of the rhubarb in this climate.

The preparation of the ground conſiſts in its being deeply ſtirred, and well broken.—At preſent, where very large ſpaces are not to be cultivated, the earth may be dug up and broken with a ſpade: and afterwards raked

raked and laid clean. But labour ſhould not be ſpared with regard to the depth. Where there is little or no declivity on the ground, it muſt be laid in pretty high ridges or beds, ſloping both ways from the middle, with proper trenches or furrows betwixt them to carry off the water.—If large quantities of ground ſhould hereafter be cultivated with the rhubarb plant, the preparation of it may be performed with the plow and other inſtruments of huſbandry. In this caſe, the land ſhould be plowed eighteen or twenty inches; which may be done by two or more plowings, in the way practiſed for that called trench-plowing; except that the lowermoſt part of the earth need not be turned uppermoſt as is there done, when it is performed for the improvement of the ſoil. The upper part of the ground ſhould be well broken, and laid even, by ſubſequent ſuperficial plowings and harrowings: and care ſhould be taken as above-mentioned to form ſuch ſix-feet ridges, with intervening furrows, as will ſufficiently prevent any ſtagnation of water from great rains. For it is neceſſary to take all precautions, that the growing rhubarb may not at any time lye under water, or be ſubject to much wet.

It is, in the mean time, proper a number of plants muſt be procured, ready to ſet out, as ſoon as the land is prepared. Theſe plants may be raiſed by ſowing the ſeed, towards the

the end of March in the preceding year, on a bed of good light earth, ſheltered from north winds; and treating the ſeedling plants after they come up in the manner above directed. Theſe ſeedlings may be tranſplanted into the full ground about the end of March, or beginning of April: and one row of them ſhould be ſet on every ridge at the diſtance of ſix feet from each other. If the ground ſhould be very dry, which, however ſcarcely happens at this ſeaſon of the year, it would be proper to defer the tranſplanting till rain has fallen, even if it ſhould be conſiderably later.

At preſent the method of raiſing the rhubarb plants from ſeed is in general neceſſary: as very few perſons are poſſeſſed of old roots whence off-ſets may be obtained. But, hereafter, when there ſhall be a ſufficient ſtock of roots of a due age to afford them, off-ſets may be employed inſtead of the ſeedling plants: which will ſave the trouble of raiſing them; and prevent the neceſſity of waiting a year till they be fit to plant out in the places intended for their growth.—The off-ſets taken from the rhubarb plants, that are of more than one year's growth, may be immediately ſet into the rows, where they are intended to ſtand for uſe, without their being firſt put into a nurſery-bed to gain ſtrength.—They ſhould, however, be taken off with the cautions

above-

above-mentioned, not to injure the original plant, nor to rob the roots too much of the herbage when they are coming to maturity. —It is proper, nevertheleſs, whenever the plants are ſet into the rows, to reſerve ſome in a nurſery-bed, in order to replace ſuch as may be found to have failed in the rows: as their place ſhould be ſupplied with plants of an equal age with the reſt, that all the roots may be fit to be taken up at the ſame time.

After the rhubarb plants are thus ſet in rows on the ridges, they ſhould be diligently kept free from weeds while they are young. —This ſhould be done the firſt year, by the hand only to a ſmall diſtance round the plants: but the reſt of the quantity of ground may be hoed: or where the ground is large, the horſe-hoe may be uſed in the intervals; and the hand-hoe only employed in the ſpaces betwixt the plants in the rows. The ſtirring the ground with the horſe-hoe, which may be done pretty near the plants after the firſt year, will be very beneficial to their growth: and this may be practiſed as often as the freſh ſprouting of the weeds makes it it needful, for three years after the firſt planting. At that time, the rhubarb plants will have gained ſufficient ſtrength to overpower any common weeds, that can riſe in ground, which has been kept well free from them for the three or four preceding years.

—This

—This is all the culture, that is requiſite from the time of ſetting the rhubarb plants, till the roots attain a proper age to be taken up for uſe. For, if the plants once take root, there is little danger of them, if they be prevented for the firſt year or two, from being choaked with weeds: and though this kind of rhubarb does not grow naturally, but in a climate ſome degrees more ſouthern than ours, yet experience has ſhewn us, that it is hardy enough to bear the rigour of very ſevere winters even in the ſouth of Scotland. Indeed, we might conclude, it is capable of reſiſting ſtrong froſts from the woody texture of the roots; as well as the reſinous nature of the juices of them, and the depth with which they penetrate into the ground.

The moſt proper time for taking up the roots of the true rhubarb for medicinal uſe is, when they are of the growth of ſeven years. In the caſe of roots that are produced from ſeed, this period muſt be reckoned from the time of the plant's firſt coming up. But when they are produced from ſtrong off-ſets, taken from plants of more than one year's age, a year muſt be allowed on that account: and ſix years from the planting muſt be conſidered as along with that year making up the ſeventh.—The rhubarb will attain its perfection in ſeven years growth: but the roots will increaſe in the eighth year, or longer, without any injury to their qualities.

The ſeaſon moſt proper for taking up the roots of rhubarb is, the latter end of autumn, when the leaves are decayed; and the plant is in the weakeſt ſtate of vegetation. But, if the weather or other circumſtances, do not admit of the opportunity of doing it conveniently ſo ſoon, it may be performed any time before the end of December.

The rhubarb roots, where the quantity of ground on which they grow is not very extenſive, may be taken up by the common means of digging. But where there is a great ſpace of ground in queſtion, it may be expedient to gain, for the ſaving time and expence, ſome aſſiſtance from the plow in performing that work. In ſuch caſe, the earth ſhould be thrown off from the ſides of the roots, by plowing two trenches as near them as is practicable without danger of damaging them; and laying the whole of the earth on the outer ſides: the reſt muſt be performed by the ſpade afterwards.—When the rhubarb roots are taken out of the ground, they ſhould be well cleanſed by waſhing them in water, and then dried by wiping with a cloth; or, where there are large quantities, by ſpreading them on any clean place where the air has acceſs to dry them. There is a machine, which conſiſts of a kind of a hurdles, framed together, very proper for this purpoſe. It was invented for the drying madder; but may be very

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advantageouſly uſed in the caſe of large quantities of rhubarb roots. A model of it is now in the repoſitory of the Society for the Encouragement of Arts, &c.—After the roots are thus cleanſed, and rendered dry as to the water uſed in the waſhing them, they ſhould be put together in any airy place for ſome days, that the reſinous juices may fix or concrete. After this the larger ramifications or branches of the roots muſt be ſeparated from each other: and all the fibres and very ſmall branches cut off from them, as refuſe parts. The ſeveral branches ſhould then be divided into ſlices, or other pieces, according to their various thickneſs. The parts of the root, that are of three inches diameter, may be cut into ſlices of two inches thickneſs: thoſe of two inches diameter may be cut into pieces of three inches length: and the ſame proportion may be obſerved in the parts which are of other dimenſions. Where the joining of branches with each other cauſes knots, thoſe parts ſhould be left in the form, they acquire by the ſeparation of the reſpective branches from them, notwithſtanding they may not be of the proportion here directed. But where ſuch parts are large, they ſhould be reduced by taking off as much as can be without cutting into the knots. This diviſion of the roots into ſlices or pieces, ſhould be performed with a ſtrong ſharp knife. This

knife,

knife for the greater diſpatch, where there are large quantities, may have its point fixed to a block, by a ſmall ring: in conſequence of which, if the blade and handle be made long, and of due ſtrength, great power, and facility in doing this work will be gained.

When the rhubarb is thus cut into ſlices, or pieces, each of them muſt have a hole bored in it towards the edge; and be then ſtrung with a piece of ſtrong thread, or of packthread; which muſt be formed into a loop. By theſe loops, the rhubarb ſhould be hung on long ſticks, or ſlips of board fixt in an horizontal poſition; and furniſhed with ſmall nails, or tenter-hooks, at about four inches diſtance from each other. There may be as many ranges of theſe ſticks or ſlips of boards, fixt at about five inches diſtance above each other, as the height of the building will admit of: and as many rows of theſe ranges as the breadth of the building will give room for, allowing an interval of about a foot and a half between each. The ſticks or ſlips of board, may be ſuſpended by cords from the cieling; or ſupported by proper frames faſtened to the ſides of the building, or reſting on the ground; as may be moſt convenient.—The place, in which the rhubarb is to be thus hung to dry, ſhould be well ſecured from rain, and other moiſ-

ture: but it ſhould have ſuch vents or openings on the ſides, as may give free paſſage to the air, and even to the wind, where practicable, that the roots may grow the ſooner, and more perfectly dry. — In this ſtate, the rhubarb may remain without any further treatment, till it be ſufficiently dry for uſe.

The appearances, by which the rhubarb may be known to have a due degree of dryneſs, are, the ceaſing any longer to diminiſh perceptibly in ſize:—the having acquired a variegation of colour on the ſurface of the part cut; being an intermixture of brown and lightiſh yellow, marbled in the manner of a nutmeg: — and the having gained a hardiſh firm conſiſtence.—It is impracticable, nevertheleſs, to note or deſcribe by words, the proper degree of theſe appearances in ſuch manner, that a perſon not previouſly acquainted with it, by frequent inſpection of good rhubarb, may become thence capable of judging when it is perfectly attained by any parcel ſet to dry. Whence the moſt expedient method, for thoſe poſſeſſed of a conſiderable quantity of the roots in that ſtate, to whom ſuch previous knowledge is wanting, is to procure a piece of the beſt rhubarb; and to form a judgment by comparing it with their own: which will enable them to determine with preciſion.

When

When the rhubarb is found to be ſufficiently dry, it ſhould be well wiped from all duſt and foulneſs. The prime parts, which reſemble the beſt Turky rhubarb, ſhould be then picked out from the others; and if any of the ſurface, where the diviſion has been made, appear to be too light in its hue, and to want the marbled mixture of colours, ſuch ſurface may be pared with a very ſharp knife: which will revive the colour, and enhance the marketable value. The pieces next in goodneſs may, likewiſe, be ſelected from the worſt; and will make a ſecond ſort of good rhubarb. The other, or worſt part, may be reſerved to be diſpoſed of as an inferior kind; but will yet be ſaleable at a lower price, for making tinctures, &c.: for which purpoſes, it will very well ſerve.

The whole of all theſe ſorts of rhubarb ſhould, when they have been ſeparated, as here directed, be put into boxes, lined with paper, and well ſecured from air or duſt: and they may be thus kept, in a dry place, till wanted for ſale or uſe.

ARTICLE XV.

An Account of the Qualities, Culture, and Uſe of a very valuable Species of POTATOE, *lately brought into Cultivation in* England.

THE kind of potatoe, of which the following Account is given, has hitherto no eſtabliſhed name. But it is neceſſary, in order to diſtinguiſh it from the common kinds, in treating of its difference from them, that it ſhould have ſome peculiar denomination.—If we were to ſpeak of it, as an object of natural hiſtory, and to borrow a name of diſtinction from its ſenſible qualities, it might be moſt properly called the CONGLOMERATED POTATOE, from the almoſt conſtant appearance, that each potatoe of this kind conſiſts of a number of leſſer tubers, or potatoes grown together; or is, as it were, a cluſter of ſeveral united with each other.—But it is more ſuitable to the ſtyle of huſbandry, to give this potatoe a familiar name, taken, as is uſual, from the place where it firſt began to be largely cultivated, or much known: and, on that principle, we may properly call it the BEDFORDSHIRE POTATOE: which name I ſhall, therefore, adopt in ſpeaking of it here.

The great utility of the common potatoe, as

as an article of human food, has now been a number of years well known with us: though the actual uſe of it has not prevailed among the poorer people, in many parts of England by far ſo much as might have been expected, or wiſhed. The cheapneſs of this root, compared with other eſculent vegetables, particularly recommended it much earlier to the Iriſh, at a time, when a great part of the lower people of that country were in a ſtate of poverty, from the want of tillage, manufactures, and trade: and their remarkable health and ſtrength when almoſt ſolely fed with it, evince its wholeſomeneſs and nutritive properties: while the preferable fondneſs to every other kind of food without the leaſt ſatiety, which theſe people almoſt univerſally have for it, ſhews it to be naturally as agreeable to the human appetite, as to the conſtitution.—The uſe of the common potatoe, as an article of agriculture for the feeding cattle and hogs, is of much later introduction with us: and, indeed, has yet made but little progreſs. The Iriſh have applied this root for a conſiderable time very largely to the feeding hogs and poultry; but hitherto not at all, or in a very confined manner, to the feeding of cattle. —The reaſon, why we have been prevented from earlier enjoying theſe advantages, lies obviouſly in the price of labour, and land in England: which hindered us from obtaining

this root at a ſufficiently cheap rate, till by the ſubſtituting the uſe of the plow for that of the ſpade, both in the planting and taking up, we made ſuch improvements as to ſaving of expence in the cultivation, that we have been enabled even to ſend large quantities from our north-weſtern counties to Ireland: and that, even in the out-parts of London, it has been found profitable to rear neat cattle with this root.——The more extenſive cultivation of potatoes with a view to the rearing and fattening cattle as well as for the food of the poorer ſort of people muſt, therefore, produce great benefit to the public: ſince the crops of this root prove frequently the beſt in thoſe ſeaſons, when through too much wet weather, the corn fails, and the hay is ſpoilt. Whence a ſecurity is afforded againſt an abſolute want of food for the poor; and againſt that ſcarcity of winter, and ſpring food for cattle, which is a principal cauſe of the incidental dearneſs of proviſions with us. — The application of the potatoe to the rearing cattle will, moreover, when it can be done with profit, be in ſome manner a ſubſtitute for the paſture of the commons now incloſed: the loſs of which, according to the apprehenſions of many, tends to occaſion a great decreaſe in the number of cattle reared: as the ſaving, that accrued to farmers and cottagers from the enjoyment of the common-right, in

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the expence of bringing up cattle, was the principal means of their gaining by them; or frequently of their being able to keep them at all.

With reſpect to the feeding hogs with potatoes, it is not yet demonſtratively determined, whether, in our country, the common potatoe, parſnips, or carrots, be the cheaper food under the preſent circumſtances. But as the potatoe may often be raiſed on land, where the others will not afford copious crops, as they require great depth and lightneſs, as well as richneſs of ſoil, it muſt at leaſt be allowed a local preference for this uſe.

Though the improvements, in the culture of the common potatoe, have already advanced its utility ſo far, with relation to the purpoſes of agriculture; yet there ſeems ſomewhat more wanting, in order to its being very generally ſuitable to the farmer for feeding cattle and hogs. The copious product in a ſucceſsful crop makes it anſwer, in the end, to thoſe who can afford to be at the neceſſary expence: but requiring a conſiderable ſhare of labour and manure, as well as good land, the raiſing potatoes in great quantities is not a compaſſable matter to many, who might, otherwiſe, conſume them advantageouſly.—To remove this obſtruction to the more general uſe of potatoes for the feeding cattle and hogs, what ſeems

further wanting is, the means of raiſing on inferior land, and with leſs manure and labour, crops equal to thoſe now obtained; or much larger crops on good land with the full quantity of manure: which would leſſen the proportion of the expence of the culture to the product.—Being provided with theſe means, the leſs able farmer, might, according as either of theſe advantages ſhould ſuit his particular ſituation and circumſtances, be able to undertake the culture of potatoes without more difficulty than would attend any other crops; as his diſburſements would be diminiſhed; and his limitation as to the quality of land or quantity of manure and work removed.—Theſe requiſites to the cheap, eaſy, and conſequently general culture of potatoes, ſeem to be attained by the acquiſition of this new kind of them, which, for the reaſon above-mentioned, I ſhall call the BEDFORDSHIRE POTATOE, and of which, the importance appearing in this light, ſo ſtriking, muſt render an account of its introduction, qualities, and beſt mode of culture, acceptable to all engaged in purſuit of the improvements of agriculture.

Applications were made to the Society for the Encouragemt of Arts, Manufactures, and Commerce, with reſpect to the Bedfordſhire potatoe nearly at the ſame time, from two different quarters; and they took their riſe from the following circumſtances.

A gen-

A gentleman of fortune in Northumberland found a new kind of potatoe was cultivated among his tenants; and that it was much preferred by them to the common kinds. He inquired whence they had obtained it, but could receive no certain ſatisfaction as to that point: only ſome of the people declared it to be their opinion, the firſt of theſe potatoes had been found on the ſea-ſhore, in conſequence of their being thrown or waſhed, out of ſome ſhip, that had been wrecked on the coaſt, which brought them from ſome foreign country. It appeared to this gentleman, on further examination, that this kind of potatoe had extraordinary qualities, and were different from the common, particularly with reſpect to the prolific diſpoſition of the roots: which he conceived might poſſibly render a further knowledge of them of importance to the public. In conſequence of this, he brought a few of the potatoes to London; and ſome of them were planted in the Duke of Northumberland's garden at Sion. Cuttings of them were ſet in ridges; but at conſiderable diſtances. When they were taken up, it was found that the ſingle potatoes exceeded the common kinds greatly in magnitude; and that the product of the whole was, alſo, much larger. Some of them weighed four or five pounds; but they had the appearance of being a *congeries* or cluſter of a number

ber together, rather than one diſtinct tuber or potatoe. The colour of the inſide of them was ſomewhat different from that of the common potatoe, being much redder, and marbled with ſhades of deeper red. It was remarked, likewiſe, that the whole of the roots, confined themſelves to a much leſs ſpace of ground; the ramifications neither running ſo deep, nor ſpreading themſelves out ſo wide, as in the common kind. Shoots of roots, with ſmall tubers or potatoes upon them, ſprang out, alſo, from the ſtalks of the herbage to a conſiderable height above the ground: and, whenever they reached the earth, grew very ſtrongly; and again ſhot out branches with tubers, in the ſame manner as the original roots. This gave the moſt evident marks of an extraordinary prolific diſpoſition in the roots: and another fact evinced it in a manner even ſurprizing. A potatoe happened to be left in a room, by the gentleman who had procured this trial of them to be made in Sion garden; and remained there about two months, during his abſence in the country, expoſed to the air of the room on a plate of ſtoneware. On his coming back, he found, without the aſſiſtance of any earth or moiſture, but that attracted from the air, in a dry room with the windows ſhut, this potatoe had ſent out a great number of ſmall fibrous roots, and about ſixty or ſeventy ſmall tubers.

bers or potatoes of various ſizes, from that of a horſe-bean to that of a ſmall pea. Theſe roots, afterwards, without any earth or water being put to them, made ſmall ſhoots of herbage.—The potatoes, alſo produced in Sion garden were found heavier, and more ſolid, and ſweeter in their taſte, than the common ſorts: which indicates that this kind is a more nutritive food to animals.—From the obſervations on theſe ſeveral facts it was preſumed, that this potatoe might, at leaſt, prove of greater utility in feeding cattle and hogs than the common ſorts; if not afford, alſo, better and much cheaper food for the uſe of mankind; and, in order to introduce them to the public notice, ſome of them were carried to the Society for the Encouragement of Arts, &c. and ſubmitted to the examination of a committee.——At that very time it happened, that Mr. Howard, a gentleman of fortune in Bedfordſhire, had ſent to the Society a quantity of the ſame kind of potatoes raiſed by him in different ways; and, with them, ſome account of the experiments and obſervations he had made, with reſpect to the culture of them.

The Committee, on the Inſpection of the potatoes, and the conſideration of the accounts of the facts laid before them, came to the following reſolution: which, on being reported, was confirmed by the Society.

"Reſolved,

"Reſolved, it is the opinion of the com-
"mittee, that the kind of potatoes refer-
"red, of which Mr. Howard has given a
"moſt ingenious and inſtructive account, may
"prove a conſiderable improvement as well
"for the feeding cattle, as for the table, on
"account of their great increaſe and nutri-
"tive quality."

As Mr. Howard preſented the Society with a conſiderable quantity of the potatoes, they were diſtributed among ſuch gentlemen as were deſirous of cultivating them *.

In order to give a more diſtinct knowledge of what has been already diſcovered with reſpect to the culture and uſe of this potatoe, I will here give the Obſervations communicated to the Society by Mr. Howard; and then ſubjoin ſome further Remarks founded on trials and experiments ſince made.

MEMOIR *on the Qualities and Cultivation of a* NEW KIND OF POTATOE *given to the* Society for the Encouragement of Arts, Manufactures, and Commerce, *by* JOHN HOWARD, Eſq. of *Cardington*, in *Bedfordſhire*.

"AS I have the honour to be a member
"of this Society, I would beg leave to lay

* Mr. Shields, nurſery-man, near Lambeth, procured, alſo, a ſufficient ſtock to be able to furniſh all ſuch others as might be deſirous of cultivating this kind of potatoe for uſe.

"before

" before it the account of my obſervation
" on the culture and extraordinary increaſe
" of a new kind of potatoe: which was not
" known in England, as far as I can gather
" from the enquiries I have made, till I pro-
" pagated them.

" In the year 1765, being at Clifton, near
" Briſtol, I was informed a perſon had brought
" from America a new ſort of potatoe; and,
" with ſome trouble, I procured half a dozen
" roots of it: as the greateſt part of thoſe
" brought over were already planted. That
" autumn, I planted three of them, and in
" the following ſpring the other three, in
" my garden at Cardington, in Bedfordſhire;
" ſetting them in hillocks about ſix feet
" aſunder.—The ſtrength of the ſtems, and
" largeneſs of the bloſſom and apples, gave
" me the pleaſing proſpect of great increaſe:
" and, accordingly, when I took them up in
" the autumn 1766, I found they had in-
" creaſed far beyond any of the common
" ſort, which for ſome years I had encou-
" raged our cottagers to cultivate.—The
" produce from each cutting was in weight
" from twenty-ſix to twenty-ſeven pounds
" and a half.—I ſent for two of the Bedford
" gardeners, who ſerve the market, to ſee them
" taken up; and they were ſurpriſed at the
" great increaſe. I gave ſome of them to
" theſe gardeners; and others to almoſt all
" our own cottagers.——The increaſe con-

" tinued

" tinued to appear the ſame in the ſucceed-
" ing year, viz. 1767, as in the laſt: only
" as many of the ſingle potatoes had been
" then found to weigh four or five pounds
" each; I had now planted moſt of them in
" drills three feet aſunder, in order to pro-
" cure a greater number, and a leſs ſize.
" Their produce was now from twenty-two
" to thirty pounds from each cutting: and
" the potatoes were more ſizeable, for com-
" mon uſe. The vegetation was not ſo luxu-
" riant as in thoſe I before planted in hillocks:
" but the increaſe of theſe was, allowing the
" cuttings to weigh one ounce, full four hun-
" dred fold.—Having laſt year upwards of a
" waggon-load of theſe potatoes, I with
" pleaſure ordered it to be made publickly
" known, that every perſon who choſe to
" cultivate them, were welcome to have a
" quantity for planting. In conſequence of
" this, numbers applied in our own and the
" adjacent counties. In my plantations, as
" well as thoſe of other perſons, the increaſe
" has been ſtill greater this year. For the
" ſeaſon having proved very favourable, I
" have had, from ſome hillocks forty-one
" pounds and a half, allowing for dirt.

" I this year ſtript off many ſtems from
" the plants, leaving only two or three of
" the principal, in order to try if that would
" cauſe a greater increaſe of the roots. But
" this method did not ſucceed: as I found

" many

" many rotten potatoes in the ground:
" which, probably, had been nourished by
" thoſe ſtems I removed, till the time they
" were deprived of them.

" I tried another experiment relative to
" tranſplanting of the roots. In June, I took
" up the whole root, which produced about
" ſix pounds of potatoes, I then ſtript all that
" were ſmall; and planted the ſtems in an-
" other place. At the uſual time of taking
" them up, there was none leſs than eleven
" pounds; and many that were fifteen,
" twenty, and twenty-five pounds. I tried
" the ſame with the common ſort of pota-
" toes; but did not ſucceed.—I would beg
" to make one additional remark, from many
" years careful obſervation it appears to me,
" that a cutting produces more and better-
" ſized potatoes than a whole potatoe of the
" ſize of the cutting, put into the ground:
" yet a whole potatoe, three or four times as
" big as the cutting, produces rather more
" than the cutting.

Cardington, Bedfordſhire,
December 21ſt, 1768. JOHN HOWARD."

Mr. Howard, after the above, gave in a further account of his Experiments and Remarks on this potatoe, and its culture, as follows:

Additional

Additional MEMOIR on the NEW KIND OF POTATOE, &c.

" IT may be proper to obſerve further, " that on poor ground, being either clayey, or " gravelly ſoil, where it has been found, on " trial, the common kinds of potatoes would " not grow at all, a ſmall crop has been " produced of this new kind. On ſome- " what better ſoil, where a ſmall crop of the " common ſort has been produced a much " better crop of the new ſort, even equalling a " middling one of the common, has been " raiſed. On a ſtill better ſoil, the increaſe " has been yet proportionable: I have, in " ſhort, found at the moſt moderate and " loweſt eſtimation on all ſoils, that I have " known and tried, the increaſe to be full " three times as great as that of any of the " ſorts of the common potatoes: though, " in ſome places, where I have planted beds " of each, that is of the common and the " new ſort, adjoining one to the other, the " increaſe, theſe two laſt years, has been " about ſix times more of the new than of " the common.

" Many hogs are greedy after all ſorts of " potatoes: though ſome will not eat any. " They ſeem to prefer my new ſort much to " the other: and I ſhould think it more nu- " tritive, becauſe an oilineſs appears on the " water

" water in which the potatoes have been " boiled, that is not to be found in the com- " mon ſort.—For three years, that is, ever " ſince I have raiſed this kind of potatoe, I " have had them conſtantly at my table; " really preferring them to all others when " well boiled: and though, perhaps, I may " be partial to this kind, as I have taken ſo " much pains to cultivate it; yet many, and " I do ſay moſt people, that have dined with " me, have been of the ſame opinion. But, " whatever judgment may be formed of " theſe potatoes, when boiled; yet, when " roaſted, they are far beyond any other " kind: and the gardeners at Bedford in- " form me, that all people, in general there, " are fond of them, as appears by the great " demand for them for this purpoſe.

" I mentioned my planting the new po- " tatoes in three feet drills, to prevent the " luxuriant largeneſs of them: as, in the " hillocks and outſide rows, they grow to " four, five, and ſix pounds, in rich ſoils. " The reaſon of which I apprehend to " be, that the ſun, and air, not having ſo " free acceſs to the branches of the her- " bage of the middle rows, the ſtems are " evidently weaker; and the potatoes pre- " ſerve a far more uſeful ſize, viz. from half " a pound to a pound: and thoſe of the " largeſt ſize are more a matter of curi- " oſity than of that real and general uſe to

" mankind; which ought ever to be the
" leading view with every conſiderate man.
" I muſt further remark one happy and en-
" couraging circumſtance relative to the cul-
" tivation of potatoes. It is, that wet ſum-
" mers, which are moſt detrimental to the
" wheat crops, are moſt beneficial to thoſe
" of this root. I have ſeen it on that, as
" well as other accounts, very beneficial in
" my own neighbourhood: and I hope it
" will, in future time be, in general, a great
" relief, and help to a moſt valuable part
" of our fellow-creatures, the labouring poor
" in this kingdom. As I have found ſeeds
" from other countries produce very great
" crops the firſt year, and after that, almoſt
" quite fail *. I was willing to have three
" years full and cautious trial in this,
" and other ſoils, before I laid my Ob-
" ſervations before the Society: which I
" ſhould have done ſome time before Chriſt-

* The degeneration, that is frequently found in plants raiſed ſucceſſively by ſeeds, principally ariſes from their receiving the farina fecundans of ſome other kind nearly allied to them, and cannot conſequently happen on the ſame principle in the caſe of cuttings, or off-ſets, and they, therefore retain the qualities of the parent plants, except when changed by difference of ſoil, climate, or other exterior accident. But, as this kind of potatoe had been lately brought hither from America, Mr. Howard's precaution was proper till it had been obſerved, how far the habit of the plant was ſubject to be gradually changed in this country. R. D.

" mas

"as had I come to town from Cardington. But, being now fully convinced of this very uſeful and prolific plant's not degenerating, I, with great pleaſure, ſubmit it to the conſideration of this learned and ingenious Society.

Cardington, Bedfordſhire, February 15, 1769. JOHN HOWARD."

N. B. "I muſt not omit to mention, with "reſpect to the new potatoes which I "planted in drills, that thoſe drills were "three feet aſunder; and that I planted "the cuttings, alſo, three feet diſtance from "each other for theſe laſt two years.

"There is one advantageous circum- "ſtance relating to this kind: which I "omitted touching on before. It is the "manner of growth of the potatoes: which "crowd, as it were, altogether; and very "few ſmall ones are produced. This "affords the means of entirely eradicating "them; and exchanging their place of "culture at will: whereas I have ever "found the doing it very troubleſome "with all the common ſorts of potatoe."

It has come to light from further information, obtained ſince the ſpecimens of this kind of potatoe were firſt laid before the ſociety, that it has been brought into England

at different times; and cultivated by a few perſons in ſeveral places, but rather as a matter of curioſity than of uſe.—Amongſt other authentic accounts, one has been given, that ſome of theſe potatoes have been raiſed in Dorſetſhire, where the lower people ſeemed more fond of them than of the common kind: but they were not equally approved of at the tables of people in higher life.—The cultivation of them has not, however, been ſpread much any-where, except in the neighbourhood of Mr. Howard, in conſequence of his endeavours to that end; and, in a leſs extenſive manner, in one part of Northumberland, as above-mentioned: in both which places, the meaner people have expreſſed much more liking to them than the ſuperior.—It is not to be wondered at, that, notwithſtanding the advantages of this kind of potatoe over the common, the cultivation of it has not been more adopted in the places where it has been made known. For potatoes, in general, have been but little regarded in Great Britain as an article of huſbandry, unleſs in particular parts of the country; and even there, ſcarcely ever but with a view of ſelling them for the table: and the uneven, cluſtered figure of this kind, together with the redneſs of the inſide, makes them exceptionable at market to thoſe, who are not acquainted with their good qualities. This has been found on more than one

trial

trial near London; and will be an obſtacle to their being raiſed by gardeners; but not to their being cultivated for feeding cattle or hogs, in which caſe they are conſumed by the perſons who raiſe them; or by thoſe, who may be eaſily informed of their properties.

It is to be hoped, however, that time will remove all the difficulties to the rendering the cultivation of this valuable kind of potatoe general: as it may prove of the greateſt utility in huſbandry for the feeding cattle and hogs; and furniſh a very cheap article of wholſome diet for the common people: as will appear when we take the following review of the more advantageous qualities it poſſeſſes, compared with the ſorts uſually cultivated.

The Bedfordſhire potatoe is unqueſtionably much more prolific than the common kinds. For a number of trials made by others this laſt year have confirmed the truth of Mr. Howard's obſervations; and have manifeſted, that its increaſe and comparative product is much greater. This renders a crop of it exceeding large on very good land: but we have not any account of its being hitherto cultivated with all the ſame advantages as the very beſt crop of the common potatoe; and, therefore, cannot poſitively determine what the moſt copious product may amount to. This quality of affording a much greater crop than the common potatoe on the ſame ſpace of

land of any kind, is the firſt and principal advantage of it.

But from this prolific quality of the Bedfordſhire potatoe, there ariſes another collateral benefit: which is, that, as it yields, on land of middling degree of richneſs, a produce equal to that of the common kinds on land of the firſt degree, thoſe farmers, who have not land naturally rich, or who cannot ſpare much manure, may yet be able to cultivate this kind; and even with greater profit than thoſe who raiſe the common kind on rich land: as the amount of the difference of the rent of the land, or value of the manure, will be ſaved. This renders the cultivation of it as ſuitable to farmers of narrow abilities, who only occupy land of middling quality, as any other crop.

The potatoes, produced by the root of the Bedfordſhire kind, grow much cloſer together and nearer the ſurface of the earth than thoſe of the common kinds. Whence they may be taken up with leſs labour and expence: and, as Mr. Howard has obſerved in the above-given Memoir, the land may be more readily and effectually cleared from the remains of them, in order to make it fit for a ſucceeding crop of any other kind.

The potatoes of the Bedfordſhire kind are much more liked by hogs than the common kind: as appears from the hogs being ſo ſtrongly allured by the ſcent of them, that they

can ſcarcely be kept, by any fence, from breaking into the fields, where theſe potatoes are growing. Hence, as the proportion, the hogs will eat of them, will be greater than that of the common kind, they will grow ſooner and more fat with them. It appears from ſome trials, that cattle have, likewiſe, the ſame preferable liking to them; which will of courſe be attended with the ſame conſequence as to their growing fat from them.

They are, alſo, more nutritive than the common kinds: as may be concluded from their being more ſolid, heavy, and ſweet; and from their containing more FARINA, or flour: which has been proved by experiment.

On this enumeration of their qualities, and the profitable application of them, the Bedfordſhire kind ſeems to anſwer the whole of what was wanted, to render the uſe of the potatoe, as a food for cattle, and hogs, either for rearing, feeding, or fattening them, a moſt important improvement in agriculture. And could the common people here be brought, in general, to have a liking for them, they would be a very cheap food, and a ſecurity againſt the miſchiefs of accidental ſcarcity of corn. They would alſo produce a national gain; as that quantity of grain they would ſave, would be ſpar-

ed, for exportation. Indeed, as an eligible plant, they have great merit, in every reſpect, but their appearance. When boiled thoroughly, they are equally well taſted and white, with the common potatoes; but, under-boiled, they have ſomewhat of the ſweetneſs of the Jeruſalem artichoke, and retain their reddiſh colour. When roaſted, they are allowed on all hands to be preferable to the common kinds.

The method of culture of the Bedfordſhire potatoe recommended by Mr. Howward is, on the whole, the beſt in general that has been tried.—On ſoils, that are not very rich, the cuttings may, however, be placed cloſer by half a foot or more than he mentions. Becauſe the herbage, being leſs luxuriant than on rich ground, the air will have ſufficient acceſs to the ſtalks. But in rich lands, the facts he mentions, clearly ſhew, that his diſtance is a good one.—It muſt be allowed, indeed, that the ſpace of land he propoſes, would admit ſufficient room for the roots, if they were much cloſer; and, alſo, for horſe-hoeing the intervals. But, in moſt caſes, where the roots conſtitute the crop, regard muſt be had to the flouriſhing ſtate of herbage; which depends, in a conſiderable degree, on the not obſtructing the freer paſſage of the air: otherwiſe the roots will fail of their due growth, and

proper

proper qualities. This is apparently the caſe of the potatoe, from the facts mentioned by Mr. Howard, both with regard to the ſuperior ſize of the potatoes, in the outward rows: and the rotting of part of the roots, when we took away part of the ſtalks.—The proper medium, therefore, lies betwixt loſing too much ground, by having too few plants; and increaſing the number ſo much, that the roots will not have proper nouriſhment from the herbage on account of its want of free air; and, therefore, not yield a due product as to number, or the ſize of potatoes.

ARTICLE

ARTICLE XVI.

A CATALOGUE *of the* MACHINES *and* MODELS *in the Repoſitories of the* Society for the Encouragement of Arts, Manufactures and Commerce *.

* The Society have procured, by their premiums, bounties, or the favour of gentlemen, who have been incited to promote their views, a very ample collection of machines and models. Of theſe, ſeveral are wholly of new invention: others are improved conſtructions of ſuch as were before made in a leſs perfect manner: and ſome, though not of very late invention or improvement, are ſuch as were ſo little known, that they may be conſidered in relation to the conſequences of bringing them to light, as new with reſpect to the public. Among them are many, that are of approved utility, as well with regard to agriculture and manufactures, as other œconomical purpoſes; and ſome, which, though they are not at preſent brought to practical perfection, may yet furniſh ſuch lights, as will lead to a complete application of the principles in future attempts. — The advantage the public may derive from this collection can, however, actually be only in proportion as the particulars of it are made generally, and minutely known; and it is this limitation, together with the difficulties of removing or obviating it, that prevents the very great benefits, which otherwiſe would ſpeedily accrue from the Society's endeavours.— They have, indeed, printed ſuch a catalogue as is here given for the uſe of the members, or ſuch perſons as have liberty to inſpect the machines. But it is only few others who know there is a Catalogue of that kind: and many who are remote from London, to whom ſome of the machines might be the moſt uſeful, have not any eaſy means of procuring it. In order, therefore, to promote the views of the Society, and comply with the requeſt of ſeveral gentlemen, who have expreſſed their deſire that the Catalogue ſhould be inſerted in this work, I have

CLASS I.

Machines and Models, ſubſervient to Manufactures.

A New invented Comb-pot, by Mr. S. Hayward, for which the Society gave him a bounty of thirty guineas, April 13, 1763 *.

II. A longſhed Spinning-wheel, by Mr. Thomas Perrin; for which he had the firſt premium of thirty pounds, April 8, 1762.

III. A Spinninng-wheel, by Mr. John Webb; for which he had a premium of twenty pounds, March 25, 1761.

IV. A Spinning-wheel, by Mr. Thomas

I have here given it, with a few brief obſervations on ſome of the moſt important articles. This was all that could be done at preſent, as the number of other matters, which could not be properly omitted, did not leave room for more in this volume: but a future opportunity of exhibiting prints of the principal machines, and explaining their uſe and manner of application, will be taken.

* This Comb-pot for heating the irons uſed in woolcombing, by means of a furnace heated with pit-coal, and free from the noxious fumes of the charcoal burnt in the common comb-pot employed for that purpoſe, is deſcribed, and its advantages explained in page 163 of the firſt volume of theſe Memoirs. It is ſufficient to ſay here, that it performs its office much cheaper and better than the common comb-pot: and preſerves the health of the workmen, which is liable to be much injured by the others.

Perrin;

Perrin; for which he had a premium of ten pounds, March 25, 1761.

V. A Horizontal Spinning-wheel, by Mr. William Harriſon; for which he had the firſt premium of fifty guineas, April 1, 1764 *.

VI. A Spinning-wheel, by Mr. Perrin; for which he had the ſecond premium of twenty pounds, May 6, 1765.

VII. A Spinning-wheel, by Mr. Garrat; for which he had thirty pounds, part of the premium of fifty pounds, April 9, 1766.

VIII. A Spinning-wheel, by Mr. Garrat; for which he had fifteen pounds, part of the ſecond premium of twenty pounds, April 9, 1767.

* This Spinning-wheel is for the common purpoſes of ſpinning wool, flax, or cotton; and has been deemed a great improvement: as it is adapted to the ſpinning with both hands; and performs that office in a very complete manner. It was on that account introduced into uſe in the Foundling-hoſpital: and is greatly accommodated to the purpoſes of work-houſes, or other eſtabliſhments of a ſimilar nature, where a number of hands are to be employed; and the work is to find or rather force its way to market by its being cheaply diſpoſed of. The advantage of a method of ſpinning with greater diſpatch than by the common wheel, is very momentous to the public in the preſent circumſtances of the encreaſe of the price of labour, as it may ſupport thoſe manufactures, which are dependant on ſpinning, that would otherwiſe be loſt on that principle. For it will not only occaſion more work to be done by the ſame hands; but encourage a greater number to apply themſelves, from the augmentation of the profit which the greater diſpatch will produce.

A Machine for Winding and Doubling Worſted, by Mr. Jeremiah Burrows; for which he had ten pounds, part of the premium of ſeventy-five pounds, April 17, 1765.

X. A Machine for Winding and Doubling, by Mr. Cager; for which he had ten pounds, part of the premium of ſeventy-five pounds, April 17, 1765.

XI. A Machine for Winding and Doubling, by Mr. Garrat; for which he had twelve pounds, part of the the premium of twenty-five pounds, April 9, 1766.

XII. A Reel for Winding Silk from the Cocoons, by Mr. Verrier; for which he had a bounty of forty pounds, June 14, 1762.

XIII. A Silk Reel, preſented to the Society, by John Pownall, eſq.

XIV. A complete Frame and Reel, with a Baſon and Furnace, for Winding Silk from the Cocoons, agreeable to the preſent beſt method of working in Italy *.

* This reel with the apparatus, conſtructed according to the greateſt improvement of the Italian practice, is the moſt complete hitherto introduced into uſe; and is abſolutely eſſential to the producing the beſt ſilk. The want of ſuch a proper ſet of implements of a perfect conſtruction is the cauſe of a great part of the ſilk produced in moſt places of the world being of conſiderable leſs value than it would be if they were employed. Whoever would ſucceed in their attempt to the production of ſilk, therefore ought to be provided with ſuch an apparatus: or they will find their endeavours fruſtrated, when they come to wind off the cocoons, they have obtained, however good they have rendered them by a careful and judicious management of the worms.

XV. A

XV. A Model of a Loom for Brocades, by Mr. Sebaſtian Favie; for which he had a bounty of three guineas, October 27, 1761.

XVI. A Stocking Frame, by Mr. Samuel Unwin; for which he had a premium of one hundred pounds, February 14, 1765 *.

XVII. A Stocking Frame, by Mr. Whyman; for which he had a premium of one hundred pounds, April 16, 1766 †.

* This ſtocking-frame was deemed an improvement of thoſe commonly uſed for work that is not very fine. It is, according to the judgment of the Society, much more ſimple than the common frames; can be made at one third of the expence; and may be uſed with much more eaſe, and ſafety from damaging the work, by young practitioners. Its advantages are, however, leſs extenſive than thoſe of the next article: which was produced in claim of the premium the following year.

† This ſtocking-frame is a very great and complete improvement of that important kind of machine. It has many advantages over the common ſtocking-frame, the principal of which are, that it is more durable, lighter, and cheaper; that it is ſo eaſily wrought, as to admit of a man's continuing his labour three or four hours in the day longer than with the common frame; and that it will allow of any degree of fineneſs in the gage without the leaſt difficulty. Theſe were proved in the deciſion of the claim of the premium, which the inventor of the machine obtained for it, by the atteſtation of a number of the beſt judges in this matter, given in conſequence of the trials made of it.

CLASS II.

Models of Mills, Cranes, Machines for raiſing Water, Carriages, and other Machines, and Implements not reducible to any particular Claſs.

I. A Working Model of a Saw-mill, by Mr. James Stainsfield; for which the Society gave him one hundred pounds, and ten guineas for an improvement by adding a Croſs-cutting Saw, December 12, 1765.

N. B. The original Mill, of which this is a model, was erected and worked for five years, in conſequence of ſucceſſive premiums offered, and paid by the Society; amounting in the whole to the ſum of two hundred and twenty-five pounds *.

II. A Hand-mill, for grinding Corn, by Mr. John Gordon.

III. A Steel-mill, for grinding Corn, by Mr. Peter Lyon. The premium of fifty pounds was equally divided between theſe two candidates, January 11, 1758.

* The Saw-mill, which was erected by the late Mr. Charles Dingley at Lime-houſe, and is now wrought there, was executed according to this model under the direction of Mr. Stainsfield; and is eſteemed to be the moſt complete in its conſtruction of any hitherto made. Another model ſimilar to this, and made, alſo, by Mr. Stainsfield, was ſent to America, by the Society, for the improvement of thoſe erected there.

IV. A Hand-mill, by Mr. Samuel Parſons; for which he had a premium of fifty pounds, December 6, 1758.

V. A Hand-mill, by Mr. Charles Lloyd; for which he had a bounty of fifty pounds, and twenty pounds allowed him for his expences, June 17, 1761.

VI. A Hand-mill with improvements, by Mr. William Bailey; made by order of the Society from one brought from S. Cas, by his royal highneſs the late duke of York, April 11, 1760 *.

VII. A Model of a Wind-mill, by Mr. James Verrier; for which he had a bounty of fifty pounds, December 31, 1761.

VIII. A Model of a Wind-mill, by Mr. Lewis; for which he had a premium of fifty pounds, October 7, 1761.

IX. A Model of a Machine for raiſing Water, by Mr. Merryman; for which the Society gave him a ſilver medal, February 26, 1766.

X. A Model of a Wind-mill, by Mr. Nichols, April 23, 1760.

XI. A Model of a Wind-mill for Draining Land; preſented to the Society by Mr. Collier, May 31, 1758.

* All theſe mills were found too imperfect to anſwer the end effectually; but Mr. Lyon has ſince much improved that of Number III: and it is now deemed an uſeful machine by ſeveral who uſe it. But there is another ſteel hand-mill ſpecified below, Number XLVI. which, on trial appears to grind the corn very fine, and without greaſing, as it is called; that, is heating the flour ſo as to make it adhere.

XII. Ditto

XII. Ditto by ditto; for the ſame purpoſe.

XIII. A Trough and Wheel, by ditto; more fully to explain N° XI.

XIV. A Model of a Tide-mill, by the Rev. Mr. Gainſborough; for which he had a premium of ſixty pounds, June 1, 1761.

XV. A Model of a Tide-mill, by the Rev. Mr. Lord; for which he had a bounty of ten guineas, May 21, 1761.

XVI. A Model of a Tide-mill, by Mr. Coulthard. This Model was purchaſed by the Society for twenty pounds, May 12, 1762.

XVII. A Model of a Tide-mill, by Mr. Nichols; for which he had a premium of thirty pounds, April 19, 1760.

XVIII. A Model of a Machine for boring auger-holes, by William Bailey; for which he had a bounty of fifty pounds, April 19, 1760.

XIX. A Model of a Crane, by Mr. Galabine; for which he had a reward of twenty guineas, January 28, 1760.

XX. A Model of a Crane with three powers, by Mr. James Ferguſon; for which he had a bounty of fifty pounds, February 25, 1762.

* This gentleman, in conſequence of the reputation he had gained by his improvements of machines for draining, was engaged to go over to Holland to carry them into execution there.

XXI. A Model of a Crane, by Mr. Sanſon; for which he had a bounty of ten guineas, December 18, 1765.

XXII. A Lock, by Mr. Moore, for which he had a bounty of twenty pounds, March 2, 1763.

XXIII. A Model of a Four-wheel Carriage, by Mr. Cotton; for which he had a bounty of twenty guineas, November 13, 1767.

XXIV. A Model of a Four-wheel Carriage, by Meſſ. Cranefield; for which a bounty of thirty guineas was given, May 20, 1765.

XXV. The implements uſed by the Dutch in the Turbot Fiſhery.

XXVI. A Model of a Four-wheel Fiſh Carriage, by Mr. Stephen Boult; for which he had the premium of twenty pounds, May 12, 1762,

XXVII. A Model of a Two-wheel Fiſh Carriage, by ditto; for which he had the firſt premium of fourteen pounds, May 12, 1762.

XXVIII. A Model of a Two-wheel Fiſh Carriage, by Mr. Joachim Smith; for which he had the ſecond premium of ſeven pounds, May 12, 1762.

XXIX. Two Machines (exactly ſimilar to each other) for trying Ships Blocks, made by Mr. William Bailey, under the direction of Mr. Gardener, November 6, 1761.

XXX. A Model for a Machine for raiſing Water by means of a ſpiral Tube, by Mr. Wirts,

Wirts, communicated to the Society by Mr. Zeigler; for which Mr. Zeigler had the gold medal of the Society, January 6, 1768 *.

XXXI. A Model of an Apparatus for ſaving the lives of men aboard of ſhips, ſtranded on a lee ſhore, by Mr. John Winn; for which he had the ſilver medal of the Society, February 25, 1767.

XXXII. A Compaſs and Protractor, by Mr. Aaron Miller; for which he had a bounty of ten guineas, February 11, 1767.

XXXIII. Model of a Machine † for grinding and poliſhing Glaſs by horſe, wind, or water; by Mr. Jeremiah Burrows, purchaſed by the Society for twenty pounds, June 10, 1767. The original, of which this is a model, was kept at work three months, in conſequence of the Society's premiums; for which Mr. Burrows had ſeventy pounds, May 20, 1765.

XXXIV. A Machine for taking Heights and Diſtances, by Mr. Grant.

* Mr. Zeigler has ſince made great improvements in this machine, and a new model has been preſented to Society by him.

† This is not only a very ingenious machine, but very effectual for the purpoſe: and it is much to be regretted that, after the expence the Society have been at in procuring the invention and erection of ſuch a machine, it ſhould not be continued at work: as it would tend to lower the price of ſeveral material articles of commerce.

A more particular account of this momentous improvement is given in the firſt Volume of this work, page 160.

XXXV. An expanding Rod, for gauging veſſels, by Mr. Efford; for which he had a bounty of fifteen pounds, February 3, 1768.

XXXVI. A Pair of Door-hinges with ſpiral Springs, by Mr. Delivitz; for which he had a bounty of fifteen pounds, February 3, 1768.

XXXVII. A Model of proper Work to be added to Wheel-cranes to prevent the hazard of men being killed or maimed, by Mr. Pinchbeck; for which he had a gold medal, June 3, 1767.

XXXVIII. A Model of a Machine preſented to the Society by Keane Fitzgerald, Eſq. May 25, 1768.

XXXIX. A Model of Dr. Hale's Ventilator, preſented to the Society by Mr. Thomas Yeomans, Nov. 30, 1768.

XL. A Model of a Machine for making Wheel-tyre, by Mr. Hunt, for which he had a bounty of ten guineas, June 6, 1769.

XLI. An Inſtrument for gauging Veſſels, by Mr. Efford; for which the Society gave him a bounty of fifteen guineas, June 6, 1769.

XLII. A Machine for dreſſing Flour, purchaſed of the inventor Mr. Evers, January 4, 1761.

XLIII. A Cyder-mill purchaſed along with the Preſs ſpecified in the next article of Mr. Charles Lloyd the inventor, for twenty guineas, March 25, 1761.

XLIV. A

XLIV. A Cyder-preſs, purchaſed of Mr. Charles Lloyd the inventor, along with the Cyder-mill ſpecified in the foregoing article, for twenty guineas, March 25, 1761.

XLV. A Model of a Machine for dreſſing Wheat and Malt, by Mr. Machell; for which he had a bounty of fifty pounds.

XLVI. A Hand-mill for grinding Corn preſented to the Society by Meſſieurs Treeth of Birmingham, May 10, 1769 *.

XLVII. A Machine for raiſing Water out of Mines, by Mr. Weſtgarth; for which he had a bounty of fifty guineas, May 31, 1769.

XLVIII. A portable Corn-oven, by Mr. Robert Clements; for which he had a bounty of fifteen guineas, January 17, 1770 †.

XLIX. A Machine for bolting Meal, by Mr. Nathaniel Stedman; for which he had

* It appears on accurate trials, made by the Society, that, with a common hand, about a peck and a quarter of wheat may be ground in this mill in one hour, and the quantity of bran it produces from good corn is very ſmall. It is not ſubject to be out of order; will laſt many years without material repair; and the parts which are liable to be worn out, may be renewed at a moderate expence.

† This oven, on repeated trials, has been found to anſwer perfectly as well for baking bread, as other things.—It almoſt wholly ſaves the expence of fuel: being heated with a very ſmall proportion of pit-coal or cinders: and the bread is much ſweeter, and freer from the taſte of ſmoke than when baked in a common oven. The price of an oven of this kind of a moderate ſize, is five guineas.

a bounty of fifteen guineas, January 1ſt, 1770 *.

L. A Pump of a new conſtruction by Mr. Blanford: for which, he had a bounty of fifteen guineas, March 28, 1770 †.

CLASS III.

Machines, and Models, ſubſervient to Agriculture.

I. A Model of a Machine for drying Madder; preſented to the Society by Mr. George Rutt, May 11, 1763.

II. A Bee-box; preſented to the Society by Charles Whitworth, eſq. Vice Preſident, March 1, 1763.

III. Two Brabant Scythes, for reaping Corn of different ſorts; preſented to the Society by William Hanbury, eſq.

* This bolting machine is of very great utility both with reſpect to the diſpatch, and perfection with which it executes its office. It takes up very little room; prevents even the leaſt waſte of the flour or bran; and can be wrought with exceeding little force; ſo that a boy or girl may be employed to work it.

† The peculiar merit of this pump is, that the valve is ſo contrived as to avoid the choaking and ſtoppage of the paſſage, though any quantity of gravel, or any other foulneſs, be in the water to be raiſed by it. This renders it of great utility in many caſes: particularly at ſea, where an obſtruction of the pump may ſometimes occaſion great hazard. Along with this valuable quality, it appears, on experiment, to work with at leaſt equal eaſe, and efficacy as the beſt pumps on other conſtructions.

IV. A Model of a Plough for turning up Heath Ground, by Mr. Ringroſe.

V. A Model of a Thiſtle-cutter, by Mr. Ringroſe; for which, and the above, he had a bounty of ten guineas, March 16, 1763.

VI. A Land-roller; preſented to the Society by Mr. Scawen, of Carſhalton, Surry, Auguſt 5, 1761.

VII. A Model of a Plough with ſix Shares and Coulters, by Mr. Robert Gee, May 13, 1767.

VIII. A Drain-plough, by Mr. Cuthbert Clarke; for which he had a premium of fifty pounds, October 8, 1766.

IX. A Drain-plough with improvements, by ditto; purchaſed by the Society, June 1, 1767.

X. A Drain-plough, by Mr. William Knowles; for which he had a premium of fifty pounds, May 20, 1767.

XI. A Drill-plough, by Mr. Chateauvieux *.

* A particular account of this plough is given in vol. I. of this work, page 86. This conſtruction of a plough appears from its actual application, on many occaſions, where deep trenching, or turning up the ground is requiſite, to be of great utility. But it is not ſo well accommodated to the purpoſe of making trenches for cloſe drains of the kind commonly called buſh-drains, as was at firſt imagined. Later obſervation and experience have ſhewn, that ſuch drains ought to be conſiderably deeper, and narrower in every part, but particularly much ſo at the bottom, and with leſs ſlope in the lower part of the ſides: which both diminiſhes the expence of filling the drains with buſhes, or whatever matter is uſed for that

XII. A ſingle Cultivator, by Mr. De Chateauvieux.

XIII. A double Cultivator, by Mr. De Chateauvieux.

XIV. A Scarrificator; preſented to the Society by Mr. John Winn Baker, of Ireland, April 8, 1767.

XV. A Drill-plough, by the Rev. Mr. Gainſborough; for which he had a premium of thirty pounds, May 14, 1766.

XVI. A Drill-plough, by Mr. Willey; for which he had a premium of twenty pounds, May 14, 1766.

XVII. A Drill-plough with improvements, by Mr. Willey, purchaſed by the Society, June 24, 1767 *.

XVIII. A Horſe-hoe for deſtroying weeds; invented by the Rev. Mr. Hewit.

XIX. A Horſe-hoe, for deſtroying weeds, with an harrow annexed to it; being an improvement of the preceding.

purpoſe; and renders the turf leſs liable to be forced in, by any violence on its ſurface. The plough below mentioned N° XXXIII. is, therefore, much fitter for this purpoſe; and, with ſome improvements, may be made a good machine for this purpoſe.

* This is eſteemed the moſt complete drill-plough produced to the Society, taking the extenſiveneſs and efficacy of its operation together. There are others which are ſimpler, cheaper, and perhaps equally well accommodated to particular purpoſes: but none which are ſo fit for all the ends, this is intended to anſwer.

XX. A

XX. A Machine for winnowing corn, purchaſed of Mr. Evers *.

XXI. A Machine for eradicating Trees; preſented to the Society by Mr. Valtravers.

XXII. A Machine for ſlicing Turnips, by Mr. Edghill; for which he had a premium of twenty pounds, December 10, 1766 †.

* This machine takes up but a ſmall ſpace, conſidering the office it performs. It winnows the corn perfectly, and not only frees it from chaff and duſt, but ſeparates the light grains from the ſound. It is eaſily wrought by one perſon; requires no wind or air, but that of its own fan; and does not in the leaſt incommode the perſon working with the duſt. It is, therefore, a very uſeful machine, both on account of its complete performance, and the ſaving it makes in labour and trouble. The original inventor of it is not known. As it was firſt uſed in Holland, and afterwards introduced into ſome parts of Scotland: whence it found its way to Northumberland, and at laſt into Yorkſhire, where improvements were made in it by Mr. Evers, who diſpoſed of a number of the machines in that and the neighbouring counties. It did not, however, come further ſouth till brought by the Society, who purchaſed one of Mr. Evers to make it known to the public. Fewer have, nevertheleſs, been introduced into uſe than might be expected from ſo valuable an improvement of the manner of winnowing corn.

† This machine, and its utility, are treated of in the firſt volume of this work, page 82. It is a very ingenious conſtruction, and completely effectual to the purpoſe, where a machine is invented to anſwer this end. There is a great diviſion of opinion reſpecting the expences of ſlicing turneps for cattle. The Society has attempted no diſcuſſion of that point, but only provided the means of doing it with great facility, and without the danger of frequent bad accidents which attended the ſlicing turneps by hand, for thoſe who embrace this practice.

XXIII. A

XXIII. A Perambulator for meaſuring roads, by Mr. Edgworth; for which he had a ſilver medal, April 8, 1767.

XXIV. A Model of a Field-gate, by Mr. Thomas Orm; for which he had a bounty of ten pounds, April 3, 1766.

XXV. A Trenching-plough by Mr. Ducket; for which, together with the Three-Furrow Ploughs in the next article he had a bounty of fifty pounds, June 24, 1767.

XXVI. A Three-furrow-plough; for which, together with the Trenching-plough, in the preceding article, he had a bounty of fifty pounds, June 24, 1767.

XXVII. A Model of a Machine for threſhing Corn, by Mr. Evers; for which he had a bounty of fifty pounds, February 3, 1768.

XXVIII. A Model of a Machine for making cloſe Drills, by Mr. Beſtland; for which he had a bounty of ten guineas, February 22, 1769.

XXIX. A Model of a temporary Barn, preſented to the Society by Richard Lovel Edgworth, eſq.

XXX. A Drill for ſowing Turneps, preſented to the Society, by John Arbuthnot, eſq. May, 1769.

XXXI. A Drill-plough, which ſows the ſeed, and depoſits along with it any kind of manure reduced to the ſtate of a powder,

by Dr. Benjamin Gale: for which he had a gold medal, January 10th, 1770.

XXXII. A Drill-plough, by William Craick, eſq. for which he had a gold medal, January, 10, 1770.

XXXIII. A Plough for making trenches for cloſe Drains, by Mr. William Makings; for which he had a bounty of fifty guineas as a reward for his invention and diſcloſure of it for the benefit of the public; and ten guineas for the making a complete Plough and Carriage *.

CLASS IV.

Machines and Implements, ſubſervient to Chemiſtry.

I. A Digeſter, by Mr. Creagh; for which he had a bounty of thirty guineas, December 1, 1762.

* This plough was found, on trial, to have great merit in its preſent ſtate; and, with ſome improvements already well conceived, will be a good machine for anſwering the intended purpoſe. It appears, that in land of moderate tenacity and reſiſtance, it can be wrought with four horſes, under the direction and guidance of a man and a boy. It will, after the turf is removed make about fourteen hundred feet of trench in an hour without the horſes going a greater pace than they are able to hold in a whole day's work. The trench will be ſeventeen or eighteen inches in depth, ten inches wide at the top, and two and a half or three at the bottom. But the plough is ſo conſtructed by means of ſeveral ſhoulder-boards, which may be ſhifted, that the width and ſlope may be varied at pleaſure.

ARTICLE XVII.

OBSERVATIONS *on the Culture and Uſe of Timothy-graſs, Bird-graſs, Burnet, the Turnep-cabbage, and the Turnep-rooted Cabbage; communicated by the Rev. Mr.* LAMBE, *in a Memoir, to the* Society for the Encouragement of Arts, Manufactures, and Commerce; *and inſerted at their Requeſt.*

To *Robert Doſſie*, Eſq.

SIR,

THE *Society for the Encouragement of Arts, Manufactures, and Commerce*, have directed me to deliver to you, Mr. LAMBE's Obſervations on Bird-graſs, &c. in order to its being inſerted in the Memoirs of Agriculture, if you think proper.

I am your very humble Servant,

SAMUEL MORE, ſec.

To

To the right honourable the Preſident, Vice-Preſidents, and other Members of the *Society for the Encouragement of Arts, Manufactures, and Commerce*, this Paper is addreſſed by their moſt obedient humble Servant DAVIES LAMBE.

IN Auguſt, 1765, I ſowed half a pint of Timothy-graſs ſeed in my garden. By the latter end of September following, it was quite matted upon the ground; and, without much progreſs, continued in that ſtate all the winter. In May, 1766, I planted near an acre of ground with this bed of graſs: which, as it was a very dry ſummer, I was obliged to water every day for a fortnight, till the plants ſtruck root: but they then flouriſhed ſo exceedingly, as to give me great hopes of ſaving ſome ſeed from it. In July, the graſs was five feet high, and the ears of it ſeven, eight, and nine inches long: and, at a diſtance, it had the appearance of a field of wheat. In Auguſt, being ripe, it was cut, and threſhed in the field; and yielded fifty pounds of ſeed.

April 1767, having plenty of ſeed, I ſowed a field of wheat with it. It came up very thin: ſo that I did not think it worth the ſaving; and accordingly, plowed it up the following ſpring.

To know the goodneſs of this graſs, in March 1767, I ploughed up a very wet weeping

weeping ſpot, ſcarce half an acre, in the middle of a ſeven-acre field of St. Foyn; and ſowed it with Windſor-beans in rows: the intervals being well hoed, and very clean and fine. In May, I ſowed this ſpot with Timothy-graſs: which took very well. At the ſame time, in another part of the field, I ſowed much about the ſame quantity of ground with burnet. In the following ſpring, May 7th, 1768, I turned my horſes, cows, and ſheep, into this paſture; and obſerved them for a conſiderable time, in order to determine which was the ſweeteſt graſs. After a little rambling, they one and all fixed upon the Timothy; and continued there till it was as bare as a common. They then fell upon the Burnett; and eat that off before they ever eat much of the St. Foyn. This Timothy was ſown broad-caſt: and, though I have encouraged it with ſoot and coal-aſhes, it affords a very ſlender crop of paſture; and is, I think, not worth cultivating on good dry land *. What it may do on very

* The Timothy-graſs is naturally produced in wet ground: requiring a conſiderable ſhare of moiſture for its due ſupport. Where ſo ſituated, it grows luxuriant; and continues as long as any ſpecies of graſs whatever: propagating itſelf freely, as well by its roots, as ſeed. But where this ſhare of moiſture is wanting, it dwindles; and, in caſe of a great drineſs, dies. It cannot, therefore, be expected to ſucceed on dry, though even rich land: as every drought muſt prove more or leſs injurious; and either diminiſh, or wholly deſtroy it. R. D.

boggy,

boggy, wet, and moſſy land of little or no value, I know not: but I am inclined to think it would flouriſh * there; and be a conſiderable improvement.

Bird-graſs, or fowl-mead graſs, I have a much better opinion of. As the ſeed was very dear, (four guineas per pound) when I firſt made any experiment upon it, I did not venture to buy more than one ounce of it: which I ſowed July 12th, on a bed of very fine rich ground in my garden: and though I gave it very little raking, and covering, as little almoſt as poſſible, I gave it, I am ſure, by after-experience, too much. Very little of it came up; that little was well taken care of: and, before Michaelmas, it had ſtocked ſo much, that I ſeparated every root; and freſh-planted it. It flouriſhed in a ſurprizing manner, vegetated all the winter, and, by the beginning of March was full as ſtrong, as when I firſt divided it in autumn.

* It appears from the accounts of thoſe, who have had opportunities of obſerving the fact, that this conjecture of the utility of Timothy-graſs cultivated on boggy land, is juſt. For this graſs not only produces a very copious burthen on ſuch land, where ſcarcely any thing elſe could be obtained; but gives, by the turf formed of its matted roots, ſo great a firmneſs to ground, that would before neither bear the tread of cattle, or men, as to admit even of the weight of carriages, after the roots have had a due time for their growth.—The full advantages of Timothy graſs, under theſe circumſtances, have not, however, been hitherto clearly aſcertained to the public, by accounts of ſufficient trials made with care and judgment. R. D.

The

The latter end of March, when I was in high expectation of ſeeing it ſtock and flouriſh, it began to turn yellow; and more and more ſo every day. I wondered much at the ſtrange alteration: and, to try if poſſible to know the reaſon of it, I dug up a very ſtrong plant, with near one hundred blades, but growing yellow within twenty-four hours. For I had marked this plant the day before, by ſetting up a ſtick very near it. I ſoon diſcovered the reaſon of this viſible and daily decay, viz. Nine or ten wire-worms, as we call them in Kent, in the very heart of the root. Upon this diſcovery, I immediately ordered three men to dig up the whole plantation. There was ſcarce a ſingle root without one or more of theſe wire-worms. I then deſtroyed theſe pernicious animals; had the roots divided into as many plants as poſſible, and had the whole replanted in rows, of a foot ſquare: this operation reſtored the plants to a ſtate of ſuch vigour and ſtrength, that the ground was entirely covered with the graſs before Michaelmas; and yielded me ſeveral pounds of fine ſeed.

Mr. Roque has often complained to me of the great difficulty of making ſeed of bird-graſs grow: and not without reaſon. After trenching half an acre of very rich land, and ſowing it with this ſeed, he had not ſo many plants, as I had from one ounce of it. He imputed.

imputed this to his trenching the ground too deep: by which means a dead ſtinking earth was thrown upon the ſurface, in which nothing would vegetate. There may be ſome reaſon for this: but I rather think the failure owing to his covering the ſeed too deep. As it is a certain fact, that it comes up very well when not covered at all. An accident demonſtrated the truth of this. I had about a dozen of fine plants in my garden, when the ſeed was ripe; and they were cut, and laid upon the ground. Wet weather following prevented my harveſting it properly: and when fine weather did come, our attention was employed to take care of the corn-harveſt. The bird-graſs neglected and forgotten, lay on the ground near three weeks: in which time, it was grown, and had taken root ſo firmly in the ground, as not to be removed without pulling it to pieces. Ever ſince this diſcovery, I never cover the ſeed: and it never fails growing full as well as any other graſs-ſeed. I have been the more particular with regard to the cultivation of this graſs: as I am in great hopes, it will turn out a great acquiſition * to huſbandry; eſpecially for upland meadow. It

* There is ſo great a variation in the product of cultivated vegetables from accidental circumſtances, that very little ſtreſs can be laid on ſingle and ſmall trials. The bird-graſs has been raiſed, and ſubjected to comparative examination with other kinds of graſs by very good judges; who have not found it to anſwer the re-

is a very fine, ſweet, ſilky graſs; throws out a very great crop; produces a great quantity of ſeed; and the hay is exceeding good after the ſeed is threſhed out of it. I had, from one rood of ground, laſt year, a hundred weight of ſeed, and a very large load of hay. What is very remarkable, the ſeed is quite naked: having very little or no chaff adhering to it.

As to burnet, I have ſown very little ſince the year 1764: when I laid down a field of ſeven acres with it. The firſt three years, I mowed it for ſeed. The produce of which was, the firſt year, ſixty ſacks; the ſecond forty; and the third, twenty. It has been a paſture, theſe laſt two years; and has anſwered, as ſuch, exceeding well. It is now very full of graſs *; which gains upon it

commendations given of it by Mr. Roque, and its former advocates.—I have, myſelf, ſeen more than one inſtance of its inferiority to ſeveral ſpecies, cultivated ſeparately on the ſame piece of ground. It is probable, nevertheleſs, that the manner of ſowing, which in thoſe caſes, was in drills, where it was deep covered, might, according to what Mr. Lambe has above obſerved, contribute to its ſparing-crop: and, perhaps, it might not happen to be placed on a ſoil, the moſt favourable to it. As Mr. Lambe has had the encouraging proſpect afforded by the rood he mentions, it is to be hoped he will purſue his experiments on a larger ſpace of the ſame ground. For ſhould his expectations be anſwered in the ſequel, ſuch a ſpecies of graſs would be a great acquiſition for ſeparate culture: and the beautiful laſting verdure of this kind would be an additional recommendation of it for ſome particular purpoſes. R. D.

* The burnet's going off in about ſix years has happened

every year; and ſo much, that I think of plowing it up next ſpring. I have been told by many perſons, whoſe veracity I can ſafely rely on, as they ſpoke from fact and experience, that in ſome places the cattle, though ready to ſtarve, will * not eat it. What can be the reaſon of this, I am at a loſs to know. With us, horſes, cows, and hogs, are very fond of it: and, for ſheep, it is a moſt excellent paſture; I may add a very healthy one: as I never had one ſheep die in that field; though they have been there three months at a time, in the winter, without once removing them.

happened, in other places, where it has been cultivated with moſt ſucceſs. But if five years hay, or paſture, with a product equal, taken the whole year, to that of good graſs meadows, can be obtained from indifferent land at ſo ſmall an expence as that of ſowing it with burnet-ſeed; eſpecially if it be done along with barley, as above-mentioned, in Mr. Jervis's letter, page 78, it is certainly a very advantageous culture. The continuance of it in winter and ſpring, at which time it is a moſt *valuable food for ſheep and cows*; together with the effect it is now known to have in conducing to preſerve ſheep from the rot, are very great additional motives for attending to it. R. D.

* There is no fact better aſcertained, than that, in ſome places, neat cattle, horſes, and ſheep, all refuſe burnet; and in others, eat it readily. The reaſon of this difference unqueſtionably lies in the ground; and is yet a miſtery. The caution, on this account, intimated in a note, page 77, ought always to be attended to by thoſe who are beginning to cultivate burnet, on land, the quality of which they are ignorant of, as to this point.

The common turnep-cabbage being much recommended as a very hardy plant, that would abide the moſt ſevere winter, I thought it worth making ſome trial of. Accordingly, in March 1767, I ſowed an ounce of ſeed. When the plants had ſix leaves, they were pricked out; and were tranſplanted, two feet ſquare, into very rich ground. At Michaelmas, they were fourteen, and ſome eighteen inches round; and had a very promiſing appearance. The winter proving very ſevere, a great number of them rotted * with the froſt: and more in proportion than of the common green round turnep.

Mr. Reynolds's turnep-cabbage †, I have a much better opinion of; and am in great hopes, it will turn out the plant we have ſo

* It is now determined by ſufficient facts, that the turnep-cabbage, when cultivated on a drier ſoil, will ſtand the moſt ſevere winters; but that, in moiſter places, where it is more ſucculent and grows larger, it is killed by very keen froſts: It cannot, therefore, be depended on, in ſuch places, for a winter-food for neat cattle or ſheep, ſo well as the turnep-rooted-cabbage or the borçoles, which appear to reſiſt the greateſt rigour of ſeaſon in this country. R. D.

† A particular account of the culture, product, and uſe of this plant, which was given to the Society by Mr. Reynolds, who firſt introduced it, is inſerted in the firſt volume of this work: and there are ſome additional obſervations in article V. of this volume. Whatever is there ſaid in commendation of this plant is confirmed in the account given by Mr. Jeſſard of an ample and judicious trial, related in the next article. R. D.

long wanted, and ſearched after, hitherto, in vain. February 28th, 1769, I ſowed a pound of this ſeed; and, on the 26th of May, tranſplanted ten thouſand plants, on a very poor chalky bank, in a ſituation directly oppoſite the ſouth. From the day they were planted, there was little or no rain for eight weeks: and, though I expected to ſee them all ſcorched up, they continued healthy and flouriſhing; ſome ſmall plants excepted. At the ſame time, I ſet about one thouſand of theſe forward-ſown plants upon a hungry gravel, in the center of which had been an old cucumber-bed: and, though the dung was carried clear off, yet the plants on that ſpot were ſo very exuberant and rank, that they wanted room; though they were full two feet ſquare diſtant from each other; and their ſize and weight were four times greater than the adjoining plants. From hence, it is very evident, that though they will grow very * well on poor land, if well tilled, yet dung will not be thrown away upon them, any more

* The growing well, and affording a good crop, on indifferent ſoil of ſeveral kinds, is agreeable to what has been advanced by Mr. Reynolds. But in his trial he did not find that manure was of much effect: which variation from what Mr. Lambe found here, muſt be imputed to ſome accidental circumſtances. This property of flouriſhing in a poor ſoil, together with the ſtanding either great moiſture or froſt, are the two qualities, that render this plant extremely valuable. But its ſolid conſiſtence, and oily nutritive ſucculence, are great additional recommendations. R. D.

than other plants. Though the long drought on theſe plants, undoubtedly, muſt have very much retarded the growth of them: yet, when the rain did fall, they came on beyond all expectation. By the latter end of Auguſt, they entirely covered the ground: and upon the whole, the plantation is the beſt in my neighbourhood. This little crop, I have fed off with cows, ſheep, and hogs. They all devour them moſt greedily: and the hogs, in particular, rooted up the bottoms, as clean as if they had been dug up with a fork.

P. S. Laſt ſummer, I was deſired by your late ſecretary, the very worthy Mr. Templeman, to ſend the Society ſome account of what experiments, I had made on the abovementioned graſſes and turneps: which, he had heard, I had cultivated. According to his deſire, I drew up this detail to be laid before the Society: and as, by his much lamented death, I have not the aſſiſtance of his mediation, I hope you will candidly accept this ſmall tribute due to your moſt excellent inſtitution.

November 30, 1769.

ARTICLE

ARTICLE XVIII.

OBSERVATIONS *on the Culture, Product, and Uſe in feeding Sheep, of the Turnep-rooted-Cabbage communicated in Three Letters to the* Society for the Encouragement of Arts, Manufactures, and Commerce; *and inſerted at their Requeſt.*

To *Robert Doſſie*, Eſq.

SIR,

THE *Society for the Encouragement of Arts, Manufactures, and Commerce*, directed me to deliver to you Mr. JESSARD's Three Letters on the Turnep-rooted-Cabbage, in order to their being inſerted in the Memoirs of Agriculture, if you think proper.

I am your very humble ſervant,

SAMUEL MORE, ſec.

To the Society for the Encouragement of Arts, Manufactureres, and Commerce.

GENTLEMEN,

I Shall make no apology for the introduction of this Letter, it being designed for the uſe of the public; and therefore, I chuſe, it ſhould paſs through the hands of the honourable Society of Arts, &c. for the benefit of the community, in caſe they approve of it.

Some ill reports have been raiſed, either through ignorance or deſign, or both, tending to depreciate the plant called Turnep-rooted-Cabbage, lately introduced by Mr. John Reynolds * that may not only leſſen his character, but alſo prove detrimental to the public; inaſmuch, as many perſons well inclined to propagate this root, may be prevented from making trials of it.—Now, in order to remove theſe prejudices, or falſe aſperſions; and convince the public, in the moſt ſatisfactory manner, that the very reverſe is moſt true; I have ſent a ſpecimen of theſe valuable roots for the inſpection of the Society:—by which they will ſee how ill-grounded thoſe prejudices and aſperſions are.—The roots are a ſample of the produce of about three acres raiſed, by me, laſt May,

* See vol. I. articles IX. and X. and article V. of this volume.

from

from ſeed had of Mr. Reynolds; and moſt certainly do honour to him for the introduction of this kind of turnep: and, notwithſtanding they are not yet come to perfection, I make no doubt they will merit the approbation of every individual concerned in agriculture. For I can ſafely affirm, the produce to be no leſs than forty tons per acre. I am ſo well pleaſed with their growth, and my crop, that I hope never to be without a good ſtock of them for the future: ſeeing they are likely to produce ſuch abundance of good food for cattle; and that at a time generally moſt wanted: I mean in the ſpring; when they are a good ſubſtitute for the common turnep after it is gone.

It is needleſs to add more *, when the plants are before you, Gentlemen. Every inſpector muſt ſee their great utility to the farmer and land-holder. I think myſelf

* The roots were laid before a committee of the Society for their inſpection, and judgment: and had ſo promiſing an appearance, that Mr. Jeſſard ſeemed well-warranted in what he had ſaid of this kind of turnep. The committee were ſo ſenſible of it, that they deſired Mr. Box, their aſſiſtant ſecretary, to write to Mr. Jeſſard, to requeſt of him to communicate the particulars of the culture, application of the roots to feeding his ſheep, or any other material circumſtances relative to his crop. In conſequence of which he ſent the following letter. R. D.

happy,

happy, by having it in my power to ſend you theſe precious roots.—My beſt wiſh attend the the Society.

I am,

Gentlemen, with all due reſpect,

your moſt obedient humble ſervant,

Minſter, in the Iſle of Thanet,
Kent, 8th December, 1769. HENRY JESSARD.

P. S. I have this day ſhipped the roots per Capt. George Covel, a Margate hoyman. —I preſume you may receive them about Tueſday next.

To Mr. GEORGE BOX.

SIR,

I AM glad to find the honourable Society of Arts, &c. have taken ſuch agreeable notice of my letter to them, about the roots ſent, as to deſire to know how, and in what manner the culture and management were performed, together with other circumſtances attending thereon.

In obedience to their requeſt, the ſhort is, this.—Part of my field was manured with dung, and mould, mixed together; and laid on in the common manner: about forty loads per acre. The other part was well

lded over with ſheeps dung, in order to the effects of both. Little difference ap-, however, between the two. But I he preference to the dunged part at .

s land had five ploughings from Mi-aelmas, 1768, to the month of May, 1769. Each of them was performed between nine and ten inches in depth: which is as deep as my land would bear ploughing.

The ſeed was ſown the 13th of May: and the plants were ſet out, on the 27th, and 28th of June, in two foot intervals: allowing about ſeventy plants to one perch. They were hand-hoed in the month of Au-. The ſoil is a dry gentle loam; and had a wheat-crop the preceding year. I aſcertain the growth from a conſiderable number of plants indifferently choſen from the whole field. Whereby I am fully aſſured the weight is no leſs than forty tons per acre, including the whole plant taken in its natural ſtate. A fair way of computing: as the ſtock eat both root and branch without diſtinction, the whole ought to be accounted for *.—So extraordinary as this may appear to ſome, yet I make no doubt, they will

* It is in anſwer to two queſtions propoſed to him, by the committee, that Mr. Jeſſard mentions theſe particulars here. Theſe two queſtions were, *On what foundation he had formed his computation of the product per acre?* And, *Whether he included both the herbage and the roots in the forty-ton?* R. D.

ſtill

ſtill increaſe; and become a much great[er] burden before they are ſpent. For I [am] confident, thoſe raiſed by Mr. John [Rey]nolds have grown much in the ſ[ame] months, of February, March, and Ap[ril] that I have juſt reaſon to conclude, [all] of my growths will do the like. Thou[gh] indeed, at that time, I ſhall be better enabled, by experience, to give a more particular account of this choice plant: which I ſhall with great pleaſure do, if requeſted by the honourable Society.

But, Gentlemen, be aſſured nothing herein is the leaſt exaggerated beyond the truth. For I have no motive whatever in view but ſerving the public in the caſe before [you] ſhould they condeſcend to take cognizance of what has been, and now is ſtill farther going to be be laid before them, concerning the utility of this matter, than which nothing is more plain and convincing, [viz.] that this is a noble plant, and highly worthy of our reception. Whatever ſome few indivividuals may miſtakenly think to the contrary, no mortal can diſpute it with reaſon.

It is much to be wiſhed the people, chiefly concerned in agriculture, would lay aſide their obſtinate inveterate prejudices, the great evil, and bar to all improvements;—and be convinced from trials, for the good of the community.

My

My dutiful reſpects attend the Gentlemen of the Society,—and I am,

SIR,

Your very humble ſervant,

[illegible]ſter, 2d January, 1770.

HENRY JESSARD.

To the honourable Society of Arts, &c. aſſembled in the Strand, London.

My Lords and Gentlemen,

IN obedience to your laſt *, I have the pleaſure of ſaying my new turneps [illegible]rned out a noble crop both in quantity and quality.——As to the firſt, I find they have increaſed in weight upon a common average, within the months of February, March, and April, to the amount of four tons per acre; ſo that the whole product, taken altogether by a juſt calculation, is found to be full forty-four tons per acre, on an average one with another.

* On the conſideration of the foregoing letter, the Society directed a ſecond letter to be written to Mr. Jeſſard, to deſire he would preſerve a part of the crop till towards the end of the ſpring: and to inform them of the ſtate, and growth of the plants, till that period. This is an anſwer, from Mr. Jeſſard to their inquiry on that head; and on the eſtimated value of the crop, according to the manner in which he conſumed it. R. D.

Indeed,

Indeed, I know nothing equal to the roots at this ſeaſon: eſpecially, as it is a backward ſpring, and there is a great want of meat.—I have found them of ſignal ſervice to my ſheep, being fine ſubſtantial food, much ſuperior to common turneps or ſcurworts: and what is ſtill more valuable, they may be had when theſe laſt-mentioned cannot. They are therefore highly worthy our eſteem, from their coming in at a pinch of need; and conſequently ought to be propagated for ſpring-food by every individual concerned in breeding, and feeding of cattle, that has it in his power.

I come now, Gentlemen, to ſpeak of the way and manner of ſpending the crop.—It has been before ſaid, the whole was about three acres: and that the product on each acre was forty-four tons. I repeat this, to ſhew, at one view, what ſtock these roots maintained. It was three hundred and ninety ſheep from the 9th day of April to the 28th day of the ſame month, both incluſive, on the firſt two acres. For this purpoſe a field was pitched, of an oblong form: which, by a ſubdiviſion, became two ſquares. In the front, were thoſe deſigned for fattening, both ewes and wethers. In the rear, I placed my lean ſheep, in order to eat the remains left by thoſe in front. And thus all was ſpent, without the leaſt loſs.—

The

The fold was moved upon freſh plants every other day: and thoſe plants were dug up before the entrance of the ſheep.—This method prevents their food from being ſtenched by their dung and urine. Here they lived in the day-time for twenty days; but were taken out of nights into a rough paſture for ſhelter only. The weather being often times wet and cold; and the lands, where the roots grew, being very bleak and open; this became neceſſary to prevent the ground's being poached: and lying wet would have been very injurious to the ſheep.—The weather being more favourable, the 29th of April, I confined three hundred and fifty ſheep within the field, day and night, whilſt the laſt acre was ſpending. This kept them exceeding well twelve days, till the whole crop was near ſpent, the 10th of May.—— The reſult was, all throve well and liked their entertainment; not one drooped in the leaſt. The whole flock, of three hundred and ninety ſheep are much improved: and that too *without any fodder*, at a time of great ſcarcity. Theſe are very agreeable circumſtances to the huſbandman: and, I think, ſtrictly worthy of his attention.

Henceforth let no man complain for want of ſpring-food for his ſtock: ſince it is to be obtained in abundance from the culture of *Reynolds's Turnep* *. For ſo, I beg leave

* It is proper, along with theſe recommendations of the turnep-rooted cabbage, given in conſequence of Mr.

to call it: ſeeing he has taught us the uſe of it. And, indeed, a very great acquiſition it certainly is to the land-holder, whatever malice may invent, or ignorance ſuggeſt to the contrary.

It may, perhaps, be expected I ſhould make an eſtimate of the value of the crop. But this I ſhall forbear doing myſelf; and let others judge of it: yet this I know, numbers would gladly have given four-pence a head, per week, at this hungry time, for ſuch keeping as my ſheep had.

Mr. Jeſſard's, and Mr. Reynolds's ſucceſs, to inculcate a caution, not to atttempt a great quantity till ſome experience has been had of the ſoil, on which it is to be raiſed. In ſeveral inſtances, where it has been ſown by perſons of the moſt conſummate ſkill in huſbandry; and where the method deſcribed by Mr. Reynolds has been purſued; it has either produced only a ſmall turnep; or in others has ſent down a long root with little or no appearance of a bunch or tuber. This variation ſhould be guarded againſt by a previous trial: but ſhould not be a diſcouragement to the making ſuch trial. For where this plant will flouriſh, as it has done in Mr. Jeſſard's three acres, it will certainly be a great advantage to have the means of raiſing a crop, that, beſides the great benefit of providing for ſheep at the ſeaſon when all other green food fails, will produce, according to Mr. Jeſſard's account of the profit, near twenty pounds per acre, when all expences are paid; and leave the land in excellent condition for a ſucceeding crop of wheat; or to receive common turneps immediately, and barley the next ſpring, without any further dreſſing. R. D.

I hope

I hope this account will be ſatisfactory to the Society, and ſufficiently convince the people of the utility of this root.

I am, my Lords and Gentlemen,

with all due reſpect,

your moſt obedient humble ſervant,

Minſter the 14th
of May, 1770.

HENRY JESSARD.

ARTICLE XIX.

An Account of a profitable Method of ſowing Turneps in the Intervals of a Croft of Beans: communicated to the Society for the Encouragement of Arts, Manufactures, and Commerce, *in Two Letters from Mr.* PHILPOT CHAMBERS; *and inſerted at their Requeſt.*

To ROBERT DOSSIE, *Eſq.*

SIR,

THE *Society for the Encouragement of Arts, Manufactures, and Commerce,* have directed me to deliver Two Letters of Mr. PHILPOT CHAMBERS on the ſowing Turneps with Beans, in order to their being inſerted in the Memoirs of Agriculture, if you think proper.

I am your very humble Servant,

SAMUEL MORE, ſec.

To Dr. *Templeman.*

WORTHY SIR, Deal, Nov. 5, 1769.

I HAVING tried an experiment in the farming way, and found it anſwer my expectation, I hope it may, alſo, be found of benefit to the the public; and therefore beg you will be ſo good as to communicate the following lines, containing an account of it, to the Society of Gentlemen, who encourage the Arts, &c. for their approbation.

After trials, made in ſeveral years, and by different methods, in endeavouring to raiſe a crop of turneps, without the loſs of a crop of corn, or putting my land out of the regular tilths, I have, at laſt obtained, in the following manner, the thing, which I had aimed at ſo long.

In the beginning of March, 1768, I put a piece of land of ſeven acres in with long-podded beans; which I both horſe-hoed, and hand-hoed, as uſual, in the ſummer-time. The 25th of July following, I ſowed turneps amongſt them; and hoed the beans: which anſwered two ends, to clear the beans of weeds, and to heal the turnep-ſeed. As ſoon as as the turneps were up, and out of danger of the fly eating them, I pulled my ſeven acres of beans; which produced forty-ſix quarters. When I had bound my beans, and ſet them at an end, I hoed my turneps out. Theſe turneps fatted me thirteen

oxen: which together weighed 1059 ſtone 7 ℔. What turneps, the oxen had ſpoiled, kept my milk-cows the whole time the oxen were fattening.—By the 11th of February, 1769, I had cleared my ground of the turneps, except the very ſmall ones; which I eat off, by turning in a large flock of ſheep, for four or five days: and then the ground was as clean as a ſummer-fallow.—I ploughed it in directly; and ſowed it with wheat, the 18th and 20th of the ſame month: which corn produced me one thouſand, four hundred, and twenty large ſheafs of fine wheat.

Being unwilling to communicate my firſt trial of raiſing a crop of turneps, without any loſs, and chooſing rather to make a ſecond experiment of the ſame thing, and by the foregoing method, I found it to anſwer my expectation. For, on the 8th of July laſt, I ſowed ſeven acres of turneps amongſt my beans, as I had done before; and proceeded in the ſame manner: which turneps proved preferable to any in the neighbourhood, that was ſown on a ſummer-fallow. In ſhort, they were ſo good, that I ſold them to the gardeners to ſupply both Deal and Dover with turneps for the table. My land was cleaned the 28th of laſt month: and now I have ſown it with wheat.

The time of ſowing the turneps, muſt be left to the diſcretion of the farmer; ſooner, or later, as he ſees the harveſt approach.—

About three weeks before the beans are fit to pull, is a good time for it. Then the turneps will be ſtrong, and out of danger of the fly. Though I never knew any turneps eaten by the fly, which were ſown amongſt beans. The ſooner they are hoed out, after the beans are pulled, the better will be your crop. This I know by experience.

It is very plain, that the crops of turneps, ſown as above, though very valuable, are all gain. As the expence in hoeing them out, is not more than the expence of clearing the ground, after the harveſt, in order to prepare it, for the ſowing of wheat.

Thus ſeeing its utility, I intend for the future, (finding, by the two former experiments, the advantage gained,) to ſow turneps among one third part of my beans every year. So that, by this means, my land will be turneped only once in nine years throughout: which land, with good huſbandry, will, doubtleſs, bear as good corn without any more manurement, as if turneps had not been ſown.

Now, Sir, having communicated the two experiments to the Gentlemen, with my remarks on them, and my advice with regard to the time and ſeaſon to proceed in, I leave the reſt to their moſt ſerious conſideration, and

am, Sir, with reſpect,

your humble ſervant,

PHILPOT CHAMBERS.

The Committee, to whom the above letter was referred, ſent the following queries * to Mr. Chambers.

1. What number of the ſheaves mentioned in his letter will produce a quarter of wheat when threſhed? and what crops of wheat, the ſame kind of land will yield in moderate ſeaſons, when ſown in the autumn?

2. In what manner his beans were ſown with reſpect to the number of rows, and the ſpace of the intervals?

3. At what he rates the value of fattening the oxen and feeding the cows and ſheep, per head?

4. What he means by the expreſſion † healed the turnep-ſeed?

* The Committee were well appriſed, that this practice of ſowing turneps in the intervals of beans, though new in the neighbourhood of Mr. Chambers, was in uſe in ſome few particular places elſewhere; but confined to thoſe places, and far from generally known. They were ſenſible, likewiſe, as well from the facts ſo fairly and diſtinctly ſtated by Mr. Chambers in his account, as from other obſervations, that this mode of culture was beneficial; and that, conſequently, it might be of ſervice to the public to make the knowledge of it more extenſive, by the publication of this account. But, in order to render the communication more ſatisfactory and effectual, they thought it would be proper to procure a further explanation of ſome points from Mr. Chambers. The queries here ſpecified, were, therefore, ſent to him, with that view, in a letter from Mr. Box, the aſſiſtant ſecretary: and the following letter was written in anſwer to them.

† The word healed, is uſed by the farmers in ſome particular places. It was well known to ſeveral gentlemen

Whether he thinks this method of ſowing the turneps among beans of particular advantage againſt the fly?

To Mr. Box, Aſſiſtant-ſecretary, to the Society for the Encouragement of Arts, Manufactures, and Commerce.

SIR, Deal, December 4, 1769.

THIS comes, with my compliments to the Gentlemen of the Society and yourſelf, to acquaint you, I received your letter, bearing date the 28th of laſt month, by order of the Society; and, according to that, will give the Gentlemen the beſt account I can, in anſwer to their queſtions: which is as follows:

1ſt. As to the quantity of wheat *, mentioned in yours. — I have already threſhed

at the committee: but, being a local term, they thought an explanation of it from Mr. Chambers might render his meanivg more certainly intelligible, when his account ſhould be publiſhed, to thoſe who live in places where that word is not adopted: and, therefore, they made it the ſubject of one of the queries.

* Mr. Chambers, in his letter to the Society, gave the product of his crop of wheat in the number of the ſheaves, and not in the meaſure of the grain: which the committee preſumed to be owing to his not having threſhed the corn at the time he wrote; being only the fifth of November. But the Society having, with ſucceſs even beyond their expectation, offered a premium this year for the cultivation of wheat in the ſpring, in conſequence of the impediment, the wet weather of the preceding autumn had given to ſowing it as uſual at that

about fifty-four ſheaves: which yield a quarter * of exceeding good wheat; and the growth of wheat upon the ſame land for twenty years paſt, on an average, has not produced more than the above increaſe, when ſown in autumn.

ſeaſon, the committee thought it material, as well in order to obtain information with reſpect to the product of wheat ſown in the ſpring, in a general view, as for the more clear illuſtrations of the facts in Mr. Chambers's account, to know the real quantity of grain afforded by his ſeven acres, which had been ſown in the ſpring, after being previouſly ſubjected to the crop of beans and turneps.

* According to the proportion of the ſheaves of the corn to quarters of the grain, as here aſcertained, Mr. Chambers's crop on the whole ſeven acres, which amounted to one thouſand four hundred and twenty-ſeven ſheaves, muſt, throwing out fractions, have afforded twenty-ſix quarters, three buſhels of grain; which is nearly three quarters ſix buſhels, per acre. So good a crop ſhews, that the prejudice againſt ſowing wheat in the ſpring, where there is any collateral reaſon for it, has been taken up too ſtrongly in general: and that the benefit of a winter-crop need not be rejected, when the land is too ſtrong for barley, and the ſowing of other ſpring-grain is not expedient: as wheat may be ſown, after ſuch a crop, with equal advantage in ſome ſeaſons as that ſown in autumn; and, in moſt, without ſuch difference as would not be greatly overballanced by the profits of the winter-crop.—It is not from the ſingle fact of Mr. Chambers's crop, I preſume to ſay here, that, in favourable ſeaſons, wheat ſown in the ſpring will yield an equal product with that ſown on the ſame kind of land in autumn. For I ſaw the like happen in a number of inſtances of thoſe, who ſowed wheat the ſame ſpring: and the grain, likewiſe, was well ripened; and produced the quantity of good flour. How far this depended on the peculiarities of that ſeaſon is not clear. The greater length

2d. In reſpect to ſowing the beans, I make ten rows to the rood: the intervals between them being 19 $\frac{8}{10}$ inches, which is the propereſt diſtance, I have hitherto diſcovered.

3d. In reſpect to fattening the thirteen oxen, the profit, which accrued from each ox, whilſt feeding upon the turneps, is about two pounds four ſhillings, as near as I can poſſibly judge †. As I fed them ſome time upon graſs, before they eat turneps, I cannot ſpeak with exactneſs. Only this, I can ſay, that I have, by feeding oxen on them, made four pounds, per acre, of turneps ſown amongſt the beans, without the loſs of a crop of corn; but not without putting my

length of time for the corn to tiller, ſeems to be a reaſon for an increaſe of the product of grain. How far this goes; or in what manner it may be counteracted by other principles; remains to be determined by trials. But it is certain, from what occurred laſt year, that the common opinions reſpecting the diſadvantages of ſowing wheat in the ſpring were erroneous in a great degree.

† The value of the turneps, according to what is here ſtated, was ſixteen pounds fourteen ſhillings; which is at the rate of two pounds ſeven ſhillings and eightpence half-penny, per acre. It evidently appears to be a very conſiderable crop: and, if we take along with the profit, the ſecurity of not loſing the turnep by the fly; and that the whole is gained without any additional expence but that of the ſeed and ſowing; this mode of culture muſt appear very beneficial: and as it increaſes the ſtock of proviſions afforded the ſame year from the ſame land, it muſt be deemed very advantageous to the public, as well as the farmer.

land

land out of the regular *tilths*. But this was before I arrived at ſuch perfection as not to loſe my wheat *tilths*; nor put my land out of the regular *tilths*.

As for the four milk-cows, that eat the turneps, which the oxen ſpoiled, I do not value that offal, at more than two pounds ten ſhillings.

My principal reaſon for turning in a large flock of ſheep for four or five days, was for them to eat the ſmall turneps, in order that none might grow amongſt the wheat. The value of their keeping is not more than twenty ſhillings.

4th. As to what I meant by *healing* the turnep-ſeed. It is a common term among the farmers to ſay, *heal* the ſeed; or, is the ſeed well healed? For, when I ſowed turneps amongſt my beans, the hand-hoeing of my beans covered the turnep-ſeed with earth, and laid it both regular and ſmooth.

5th. This method of ſowing turneps among beans is of particular advantage againſt the fly moſt certainly. As the young plants, by that method are ſhaded * from the heat of the ſun, by the interpoſition of the beans.

* It is not to the ſhading by the beans only, the eſcape of the turneps from the fly is in this caſe to be imputed. The earlineſs of the time of ſowing the turneps is known to have a good effect in this crop: and, perhaps, the neighbourhood of the beans themſelves may contribute to keep off the fly.

I have,

I have, at this time, a ſmall plot of turneps, that was ſown amongſt beans in my garden: the ſeed of which I had from Norfolk. It is of ſo fine a kind, that the turneps, which are the product of it, are ten and ſome eleven inches diameter. Theſe turneps I intend to let ſtand for the increaſe of ſeed: being an extremely good ſort.

At the ſame time that I ſowed the above plot, I ſowed another ſmall plot adjoining upon the callow ground with ſome of the ſame ſeed, and covered it in the ſame manner. It was all deſtroyed by the fly; and, therefore, I think this laſt example to be a plain demonſtration.

According to my abilities, and experience, I have given the Gentlemen, the beſt account I can; therefore I remain, with reſpect, the Gentlemen's and your

Moſt humble ſervant

PHILPOT CHAMBERS.

ARTICLE

ARTICLE XX.

OBSERVATIONS *on the* MURRAIN, *or* PESTILENTIAL DISEASE OF NEAT CATTLE;—*the Means of preventing the Infection*;—*and the medicinal Treatment of the Beaſts when ſeized with it.*

AFTER the beſt methods of breeding and feeding cattle, the next great object of improvement in *paſtoral agriculture* is, the preſerving them from mortal diſeaſes; but eſpecially from thoſe, which, in conſequence of general cauſes, ſeize, and carry off great numbers together.—The more lax and tender habit of ſheep ſubjects them conſtantly, in our country, to ſuch a diſtemper, called the rot: which ſeems the reſult of principles ariſing from the nature of the ſoil, and climate; and ſubſiſts always in one part or other, though with various degrees of extenſiveneſs according to various circumſtances of place, and ſeaſon. But the *neat cattle*, being of a ſtronger, and more hardy conſtitution, are not *ordinarily* diſpoſed, with us, to any diſorders, that attack, and deſtroy great numbers at the ſame time, and from the effects of the ſame principle.—There is, however, a diſeaſe incidental to the beaſts of this kind, which propagating itſelf by infection; raging at times in moſt countries of Europe, and carrying

carrying ſuch deſtruction wherever it comes, that it may be truly deemed a *peſtilence* of the cattle; has, in its turn, viſited our iſland; and made us experimentally ſenſible of its dreadful conſequences. It prevails with great malignity, at this time, on the ſhores of the continent oppoſite to us: whence ſome ſparks of the contagion have been lately brought and kindled here, in more than one place, as is imagined. Happily a quick extinction followed this introduction of it into our country: but there is the juſteſt ground of apprehenſion, from theſe inſtances, as well as from other circumſtances peculiar to the preſent *, it may be again conveyed to us;

* The prevalence of the contagion of the murrain, this time, throughout the countries of the United ovinces, whence there ſeems little hopes it will be on expelled, renders it extremely liable to be brought ov r to us, in conſequence of the intercourſe we have wit thoſe countries—It is, indeed, only under particular circumſtances, as will be ſhewn below, that the cattle, with us, is ſuſceptible of this infection. Becauſe, even when moſt diffuſed over our country, it extinguiſhes intirely of itſelf in favourable periods, when the general ſtate of animals is healthful: as we have twice experienced in the preſent century. But the irregularities of the late ſeaſons; and, particularly the great alternations of heat and cold, the continuance of wet weather, and the frequency of eaſterly winds, all which are injurious to animal ſtrength, and, conſpiring in this year, have manifeſtly weakened both vegetables and animals; have conſequently rendered the cattle peculiarly ſuſceptible of this infection, as well as mankind of thoſe contagious diſtempers to which they are ſubject. This is not only evident from clear deductions, from demonſtrable principles of phyſiology; but from the fact itſelf.

and ſpread through the whole country; if the greateſt care be not exerciſed to prevent the bringing it over; and to ſuppreſs it immediately, in any particular place, where it may be found to have been brought.

This diſeaſe, ſo fatal to horned beaſts, was formerly called, in Engliſh, the MURRAIN: but it is now more generally named the CONTAGIOUS DISEASE *of Cattle*. The name of murrain ought, however, to be reſumed, becauſe it is well known there are other infectious diſtempers of cattle, beſides this, which might poſſibly ſubſiſt here at the ſame time: and the want of a due diſ-

itſelf. There being two, if not three inſtances, of the contagion of the murrain having taken effect in our iſland, within the ſpace of a year, in parts the moſt diſtant from each other. One was in the ſouth laſt autumn: which occaſioned the iſſuing the orders of council, that were then publiſhed; and the notice taken by his majeſty, in his ſpeech, at the opening the laſt ſeſſion of parliament. Another was far north, in Scotland: where it ſeems, alſo, to be eſtabliſhed on good authority, that ſome beaſts were actually ſeized with this diſeaſe. The third, but not equally well vouched and aſcertained to be this diſorder, was in Northumberland, near Newcaſtle.—The effects of the contagion in all theſe places, were confined to a few beaſts; and happily were ſuppreſſed in a ſhort time. But it is to be apprehended, that, from the increaſed diſpoſition of the cattle to receive it, in conſequence of the unfavourable circumſtances of ſeaſon, if the infection were again introduced, we have the moſt miſchievous conſequences to dread from it: and whoever will examine well the preſent orders and regulations of the government, made to hinder the ſpreading of the contagion, will find we can have very little dependance on them for our ſecurity againſt this momentous evil, as they now ſtand.

nction of name would therefore occaſion onfuſion in the communications, and deberations requiſite to the meaſures for ſupreſſing them *. — The deſtructive effects f the murrain are but too well known om the havock made during its continuance ere, with greater or leſs violence, for fifteen r ſixteen years. But the true nature of the iſeaſe is very little underſtood: and even he appearances, and obvious ſymptoms, are nown, in any diſtinct manner, only to very ew.—Conſidered, therefore, either in the iew of promoting the intereſts of agriculure, or providing the means of ſecurity gainſt a very momentous national evil, it s a matter of the higheſt importance to inveſtigate the cauſes of this diſtemper,—the anner in which its contagion acts, and ay be conveyed, — the ſymptomatic appearances it exhibits; — and the mode and ſucceſs of the trials already made to prevent the infection, or to cure the diſeaſe; and thence to deduce the beſt methods of hin-

* The having a particular name for the peſtilential diſeaſe of cattle here treated of is the more neceſſary, becauſe another contagious malady of cattle is ſaid to have broken out lately in Italy, and is called the *cancer valant*. We have as yet no perſpicuous account of the ſymptoms of that malady. But from the name, if it have any alluſion at all to the ſimilitude betwixt that diſeaſe and cancers, we muſt conclude it to be very different from the murrain: and as this new diſeaſe may ſpread itſelf over the other countries of Europe, and poſſibly reach us, it is particularly proper at preſent to keep the names diſtinct.

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dering the introduction of the contagion into places free from it, or the diſperſion of it more extenſively when introduced; and of ſaving, by medicinal aid, as many of the cattle when really infected, as is practicable with due advantage to the owner.

It is the more neceſſary, that all material information, reſpecting this contagious diſeaſe of cattle, ſhould be collected, and ſome proper plan of proceeding for its prevention and cure, thence formed, and publiſhed, becauſe nothing of this kind ſo perfect as to be of any practical uſe, has been hitherto given to the public in any language.

Many voluntary writers, in different periods and countries, have, indeed, publiſhed treatiſes on this ſubject; and ſome profeſſors of phyſic, and academic bodies have been called upon, by the authority of government in ſeveral ſtates, to deliver their opinions on it But little ſucceſs as to practical utility has reſulted from the labours of either. As to medicinal means, either for the prevention of infection, or cure of the diſtemper, nothing offered in theſe works, has been carried into general practice any where: nothing offered in them, for reaſons we ſhall have occaſion to touch on below, having been found of actual benefit at leaſt in the way there propoſed: and as to other preventive means of excluding the contagion

contagion from places free from it, or the hindering its ſpreading when it has found admiſſion, ſome meaſures very proper in their nature have been adopted both with us and elſewhere; but not ſo effectually as to the manner, as to be accounted a full ſecurity againſt the danger, to which, as was above intimated, ſome unfavourable circumſtances expoſe us, at preſent, in an extraordinary degree.—With relation to the deſcription of this diſeaſe, there are more than one work, which have conſiderable merit with learned readers. Dr. Layard's treatiſe, publiſhed in our own country, and Profeſſor Camper's publiſhed in Holland, both contain true accounts of the ſymptoms, and appearances: but they are delivered in ſuch technical terms, and manner, as render them not clearly intelligible to any but perſons acquainted with medical ſubjects; and, conſequently, not practically uſeful to owners of cattle in general; nor to others, who may have concern with the cure, or prevention of the murrain. As to the theoretic obſervations on the nature, and proceſs of this diſeaſe, there is nothing hitherto exhibited to the public, but references of it to the ſchool hypotheſes of the ſect of each writer; or reaſonings from ſingle particulars, in which the concluſions are no way ſufficiently warranted by the premiſes; nor correſpondent, in moſt points, with the general *phenomena*.

Induced, by the importance of the ſubject; together with the apparent want of a more familiar deſcription of the appearances of this diſtemper of horned cattle, and juſt account of its nature, as well as of the means of prevention and cure, as they may be thence deduced; I have here attempted to ſupply this deficiency * as far as the brevity, preſcribed me by the want of greater room in this volume, would admit. The other parts may be enlarged on to advantage, and are intended to be more amply diſcuſſed in a treatiſe publiſhed on this ſubject ſolely: but the deſcription of the appearances of the diſeaſe, which is at preſent by far the moſt eſſential of all other commu-

* While the diſeaſe was rife in this country, I endeavoured to amaſs all the information in my reach, reſpecting its nature, appearances, and cure, as well from immediate obſervation, as books. Since that time, I have extended the knowledge I then collected by the communications of ſeveral able profeſſors in the countries where this diſeaſe has more lately prevailed; and, particularly, by a correſpondence with an ingenious phyſician in Holland, who has in a particular manner applied himſelf to the conſideration of this ſubject; for which there is, at preſent, but too great opportunity in his neighbourhood. I preſume myſelf thence able, not only to give a more ſuccinct and clear account of this diſeaſe; but alſo to furniſh ſome new lights, which may lead to the obtaining a more effectual method of medicinal treatment of the diſeaſed beaſts: and, likewiſe, to the ſupplying thoſe defects, and removing thoſe difficulties, which render the proviſions made by the government againſt the introduction of the contagion into our country of leſs avail at preſent.

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nications reſpecting it, not requiring more compaſs than can be afforded to it, is fully given here.

I ſhall, therefore, firſt offer ſome general account of the murrain, with reſpect to the manner and periods of its former appearance here, and in other places;—the general effects of it;—the ſuſceptibility of the cattle, as to its infection;—the conveyance of the contagion;—and the means hitherto propoſed for the prevention of the infection, and the cure of the diſtemper. I ſhall next deſcribe the true ſymptoms, and minute appearances of it; and, as far as can be inferred from them and other facts reſpecting it, explain the true nature of the diſeaſe; and point out the indications of cure. To this, I ſhall afterwards, ſubjoin ſome obſervations on the beſt method of medicinal treatment for ſaving ſuch of the cattle as are curable; and the proper means of rendering effectual the plan of regulations ordained by the government for the prevention of the contagion.

Accounts of contagious diſeaſes of neat cattle are found in the writings of the ancients; and in thoſe of moſt of the periods betwixt them and us*, in which the ſtate of letters has

* Among the authors, who have mentioned, or treated of the contagious diſeaſes of cattle, in the earlier times, the principal are Ariſtotle, M. Portius Cato, Plutarch, Virgil, Livy, and Columella. Among thoſe of the later period are, Vegeſius, Eginardus, Geſner, Aldrovandus, Fracaſtorius, Ubbo Emmius, and Outhoff. Since the year 1711, that this diſeaſe has run through all the countries of Eu

afforded an opportunity to tranſmit to us the paſſages of the times. Several of theſe accounts do not ſpecify the ſymptoms attending on the diſeaſes. But ſome deſcribe them, though with a diverſity of circumſtances in ſome from others; and with a variation in all from the appearances now found in the murrain. Such variations of the ſame diſeaſe, at different times, and in different places, happen, however, in other inſtances: and it is, therefore, not eaſy to determine whether the contagious diſtempers of the cattle mentioned in the earlier writers, were all, or any of them, really the murrain, or not. If, nevertheleſs, it be a matter of difficulty to aſcertain this point, it is happily of as little conſequence: becauſe, as we ſhall ſee below, the means related to be uſed for the prevention or cure of thoſe diſeaſes, except the methods of hindering the conveyance of the infection, which are equally proper in all ſuch caſes, appear trivial, and inefficacious: and, therefore, no practical advantage can be drawn from

rope, there are great numbers of Dutch, German, Daniſh, French, and Engliſh writers on it, either in detached eſſays, or pieces inſerted in journals, and periodical works. The chief of theſe are Lanciſi, Ramazini, Perrault, Pujerus, Blaſius, Bates, Blondel, Goelicha, Ranold, Bruckner, Engelman, Noſeman, Tak, Kroon, Manchart, Brockleſby, Mortimer, Buffon, Graſhuys, Marquis De Courtivron, Swenke, Layard, Camper, and Monchy.

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ſettling theſe doubts reſpecting the identity of the diſeaſe, as might have been, had theſe means proved to be more effectual.

The firſt clear traces, we have of the later introduction of the murrain into Europe, commence in the year 1710, or 1711: at which time there are authentic accounts, that it was obſerved in Hungary. Whether it was brought thither from other countries, moſt probably further to the ſouth-eaſt; or, if not, how it was originally generated there; we have no lights that lead to any certain knowledge. But it was conveyed thence into Dalmatia; and propagated, through that country, to the neighbourhood of Padua: whence it ſpread over the whole of the Venetian ſtate. It was ſoon afterwards, diſſeminated through the whole of Italy; and paſſed, in 1713, through the Tyroleſe into Germany. Whence it communicated itſelf to almoſt every other part of Europe, as far north as Denmark and Sweden; introducing itſelf, alſo, about that time, into Great Britain. After this, in conſequence of more favourable ſeaſons, the contagion abated, by degrees, in all the places where it had prevailed: and, in about nine years, the infection ſeemed to be exterminated in moſt of them. There is reaſon to believe, notwithſtanding, that ſome lurking remains kept their ground in parts where the relaxation of moiſt air, and the debilitating effects of

putrid vapours, rendered the cattle more ſuſceptible of all contagion. For, in the beginning of the late king's reign, the diſeaſe revived here to ſuch a degree, as to give occaſion to the government, to make ſome regulations for the ſuppreſſion of it: tho', after a ſhort time, the infection again ſeemed to have been extinguiſhed. It, alſo, appears to have ſhewn itſelf in ſome parts of Germany even to the year 1730.

In the year 1740, or 1741, this diſeaſe again broke out in the ſouth-eaſtern parts of Europe; and made its progreſs through the ſame countries, as in its former courſe after 1710.

It was brought hither, in 1744 or 1745, from Holland, as is believed; and made great deveſtation of the cattle for ſeveral years: after which it declined conſiderably; but took freſh vigour in 1756; and continued to rage with conſiderable violence for ſome time. It then abated gradually: and, as far as appears, the infection at length was wholly loſt. As, for a number of years, we had not the leaſt ſigns of it, before the autumn of the laſt year, and ſince: when it is believed to have broken out afreſh in two or three places of the iſland: though not, as there is reaſon to conclude, from any relicks of the former, but the introduction of a new contagion brought from other countries.

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In the mean time, though we have been free from the murrain for a number of years: yet it has, during that period, viſited other places. Denmark and Jutland, in particular, felt it in 1769, with greater ſeverity than has been ever known elſewhere.——The United Provinces have undergone a yet harder fate, from ſome diſadvantageous circumſtances in the temperature of their climate. For, ſince its firſt introduction, in 1741, it has never intirely left them; but maintained its ground, though with various degrees of violence at different times: and, at preſent, it makes great ravage in the parts of thoſe countries where cattle moſt abound.

Theſe later invaſions of ſeveral parts of Europe, by the murrain, have furniſhed the opportunity of making the following general obſervations on its effects, and conſequences

It is to be firſt remarked that as the infection of this diſeaſe, prevails only at particular times, any where; and acts with greater violence at ſome times, and in ſome places, than others, according to the preceding view of its migration; ſo it affects only part of the cattle any where; and thoſe with various degrees of malignancy. This leads us to explore in what this difference of the cattle's being ſuſceptible of the infection, or exempt from its effects when expoſed to it, may lie. On examination of this matter it will appear, that where the infection

does not before ſubſiſt, it never comes, but after ſome general cauſe has weakened the habit of the beaſts in general: ſuch as very ſevere cold;—long continued want of a ſufficient quantity of wholeſome food;——repeated alternations of heat and cold in the weather;—moiſt air, replete with putrid vapours;—a long continuance of eaſterly winds;—or, what is more frequent, a combination of two or more of theſe cauſes together.—Thus we find this contagion invading every part of Europe after the year 1711, when the ſeaſon had been ſo inclement the year before, as to deſtroy a great part of the ſheep in England; and again in 1741, as mentioned above, after a very intenſe froſt, which laſted from December to April; and, by the rigour of cold, and ſcarcity of fodder, had reduced the cattle in general to a debilitated ſtate: which was ſtill aggravated by the almoſt conſtant eaſterly winds that blew the ſummer and autumn following. After the abatement of it in more clement ſeaſons, which followed that period, we find the diſeaſe reſuming its force again in various places, ſince that time, by ſimilar accidents. We ſee, alſo, that, from the ſame principles, it has long maintained its ground in countries where moiſt air, and vapour of ſtagnated water, diſpoſe to agues and other diſeaſes, that come from the laxity of the fibres: which diſpoſition is equally produced,

by theſe cauſes, in the brute and human ſpecies. While, on the other hand, it has been extinguiſhed in places, where a drier and purer air gives robuſtneſs, and vigour of conſtitution to the animals. It has been obſerved, alſo, that the infection, when it has abated during the ſummer or winter, has generally reſumed freſh vigour in the ſpring and autumn, when the alternations of heat and cold have diſordered and weakened the beaſts.

The ſame principle, with reſpect to the cauſe of the prevalence of the contagion, holds good, as to the particular beaſts, which are ſeized with the diſeaſe, or eſcape the contagion when expoſed to it. For we ſee, in all caſes, it is the weaker, which are attacked by it; and the ſtronger, which remain free from it.—It is aſcertained by a very ſufficient baſis of remark on facts, that the beaſts of a black, dark or red colour, either wholly or in mixture, are leſs ſubject to the infection, than thoſe which are white, or of a light mixture of colours: and the concurrent obſervation of all times has eſtabliſhed the belief, that this difference of colour is an indication of the greater, or leſs degree of natural ſtrength of the beaſt, as well in neat cattle, as horſes. It is equally certain, that bulls are leſs ſubject to the infection of this diſeaſe than oxen; oxen than cows; cows not pregnant than thoſe which

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are; and, among all theſe, ſuch beaſts as appear naturally of a feebler make, or are debilitated by any accidental ſuffering.

It is manifeſt too, from an equal ground of obſervation, that the ſame difference in ſtrength and weakneſs, which renders the cattle more or leſs ſuſceptible of the infection, makes them more or leſs liable to the violence of the effects of it. Thoſe, which are weaker, from any of the above cauſes, have more aggravated ſymptoms, and more frequently die of the diſeaſe, in proportion to the degree of ſuch cauſes.

It reſults, therefore, from theſe circumſtances, that though infection conveyed from ſome beaſt diſeaſed with it; is the efficient cauſe of the murrain in cattle, yet there is a prediſponent cauſe, or particular ſtate of the ſubject, abſolutely neceſſary to its acting or taking effect: and this prediſponent cauſe is, the condition of the beaſt with reſpect to weakneſs of habit, or relaxation. It appears alſo, that this weak ſtate of the beaſt may ariſe from general cauſes, either of an epidemic nature, affecting whole regions, ſuch as inclemency, of ſeaſon or ſcarcity of wholeſome food; of an endemic nature, affecting only particular places or countries, ſuch as dampneſs of the air, or abundance of putrid vapours: and that it may be produced, alſo, from ſome particular cauſe regarding the individual only; ſuch as original weakneſs of conſtitution,

conſtitution, pregnancy, or debility occaſioned by ſome accidental ſuffering.

The ſuſceptibility of the infection, and the prediſpoſition to be more violently affected by it, in conſequence of the weakneſs of the habit, are neither peculiar to cattle, nor to this diſeaſe. It is evident, from what offers in a very extenſive field of obſervation, that both mankind and brutes are liable to the attacks of moſt contagious diſorders in proportion to their defect of ſtrength. Even were it not ſo well verified by notorious facts, a theoretic proof might be drawn from inconteſtible principles of phyſiology; and from the conſtant effects of medicines adminiſtered in ſuch caſes. But this is too wide a range of ſubject to be entered on here; and would, beſides, require a previous acquaintance with medicinal ſcience in order to its being underſtood. That beaſts are liable to take the infection of the murrain, and ſuffer more from it, in proportion to their weakneſs, is ſufficiently obvious from juſt remarks on the ſubject itſelf: and it is very neceſſary to be underſtood and taken into conſideration in all practical diſquiſitions on that diſeaſe; becauſe it conſtitutes a principle, which admits of two very uſeful applications. It not only affords the means of prognoſticating, when great numbers, or ſingle particulars, will be ſeized with the diſeaſe, if expoſed to the contagion; and conſequently,

conſequently, ſupplies the proper notice and warning for the uſe of preventive methods: but it furniſhes, likewiſe, the true indication of cure; and points out what the regimen ſhould be, that will counteract the diſeaſe.

The manner in which the contagion may be conveyed, is likewiſe, a matter of great moment in the conſideration of the murrain, with a view to the preventing its injurious effects.

The obſervations already made on facts have not ſet every thing relating to it in a clear and deciſive light. There are ſome opinions reſpecting it, in which all agree; becauſe they are ſupported by evident inſtances: but there are others, which, though they have the ſanction of common aſſent, may yet be diſputed on very juſt grounds. It is unqueſtionably certain, that the murrain is communicated by tranſmiſſion of ſome contagious matter from beaſts, which have that diſeaſe, to thoſe which are ſound: but that this is done by all the means of communication generally ſuppoſed, is not, at preſent, ſo manifeſt a matter.

The effects of inoculation in the murrain, as well as a great number of other palpable facts, render it plain, that the contagious matter may be carried by other bodies, which receive it from the diſeaſed beaſt; and convey it, by actual contact to the ſound. This may be performed

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by any ſubſtance, to which the infecting particles can adhere; but is moſt likely to happen, through accident, by the mediation of any body, that is of a hairy, woolly, or pilous texture *: becauſe the matter is much leſs liable to be rubbed or cleanſed off from ſuch bodies, than from thoſe which are denſer, and have an intire and ſmooth ſurface.

But there is another mode of conveyance of the infection; which, though it muſt be allowed to ſubſiſt with regard to ſome contagious diſorders, admits of a doubt with reſpect to the murrain. This is, the communication of the contagion by *the air*.—It is,

* It has, however, been ſtrangely made a matter of doubt, by ſome eminent profeſſors in the United Provinces, whether the ſkin itſelf of a dead infected beaſt would impart the contagion: and they have even aſſerted the negative, in conſequence of the reſult of certain experiments made for the determination of this point. But ſome fallacious circumſtance attended thoſe experiments: as, appears even on the face of the relation. It would, indeed require very ſtrong proofs to gain aſſent to ſuch an opinion; than which a ſtranger paradox can ſcarcely be advanced.—It is evident, the infection is conveyed by other ſubſtances; and nothing can be more ſuited to collect and retain the matter of it than a hairy ſkin. This matter muſt, undoubtedly, abound in the ſkin of the beaſt which generates it, whether it be evacuated by perſpiration, ſaliva, or any other excretion. Indeed, whatever other bodies convey it, muſt in general receive it from the ſkin; which, if it can impart the ſame to them while the beaſt is living, muſt, in common with other bodies, retain it a certain time after the beaſt is dead.

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in general taken for granted, that the air is the chief vehicle of the contagion of this diſeaſe: and ſeveral means of prevention of its action have been inſtituted on that principle. But there is no clear fact, which in the leaſt proves this notion: and the univerſal failure of the preventive means founded on it, furniſhes arguments againſt it, as far as any thing at all can be thence inferred. On the other hand, a great number of circumſtances ſeem to evince, that the cattle are never infected, but by an actual conveyance of the contagious matter, by means of contact of a ſound beaſt with one that is diſeaſed; or with ſome other body, which receives firſt the virulent matter from ſuch beaſt.—There are many inſtances, where good fences, and other effectual means of excluſion of whatever could bring the infecting matter, have prevented the cattle in particular places from ſuffering by the contagion, though ſurrounded on every ſide by numbers of beaſts ſeized with the diſeaſe. In ſome of theſe places, the cattle have eſcaped to the laſt. In others, after a time, they have taken the infection, in conſequence of known accidents, which occaſioned the introduction of the contagion, from the actual conveyance of it by ſomewhat, that had received the virulent matter from a diſeaſed beaſt. — Where the neighbouring infected cattle were, in theſe inſtances, all

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on *one* ſide the place, in which thoſe that eſcaped were confined, this exemption of them might be reaſonably imputed, as it has been, to the wind blowing continually the contrary way, and carrying off the contagious effluvia, that might have, otherwiſe, reached them. But this ſolution of the difficulty cannot hold good, when, as has been frequently the caſe, the free place, where the cattle eſcaped, was ſurrounded by infected beaſts on *every* ſide.—The determination of this point is not merely a ſpeculative object: for it ſettles the proper nature and limitations of the means to be uſed for preventing the communication of the infection; and rightly confines them to ſuch as regard the hindering the contact of diſeaſed beaſts with the ſound, or the excluſion of bodies, which may convey the virulent matter from the one to the other *.

* The opinion, that the infection of the murrain is conveyed by the air, has been adopted, by the writers on this ſubject ſucceſſively, in all the different periods ſince the diſeaſe was firſt known, without any examination of the fact on juſt ground of proof. It ſeems to have been received, on the authority of Hippocrates, who ſaid *all diſeaſes were communicated by the air*. But this is a bad foundation for ſuch a notion. For his meaning in this general aſſertion appears plainly, by other paſſages, not to be, that all diſeaſes are communicated by contagion tranſmitted by the air; but that the air has always ſome ſhare in their original production, or in the reception of them by particular ſubjects. And even this doctrine is not to be maintained on any demonſtrative principles. For we are certain, that there are contagions,

From the facts, which have appeared reſpecting the diſeaſe, there is reaſon to infer, that the contagious matter retains its infecting power a conſiderable time. The contagion is believed, in ſeveral inſtances, from very ſtrong circumſtances, to have been conveyed to remote places in bodies tranſported by ſea: as the known intercourſe with the countries, whence it was preſumed to be brought, palpably ſuggeſted, that manner of its introduction; which could not be otherwiſe accounted for. Some of the later experiments, with regard to the inoculat-

contagions, of which the infection is not conveyed by the air; as the venereal diſeaſe, elephantiaſis, yaws, and itch: and we know ſo little of the origin of them, that we can by no means preſume to ſay, the air had any part in their firſt production.

In the elephantiaſis, and in moſt other contagious diſeaſes, it does, indeed, appear, that the air epidemically, or endemically may act as a prediſponent cauſe to the contagion's being received: but there is a great defect of evidence of its being actually a vehicle of the contagion, with relation to moſt ſuch diſeaſes. Becauſe it is very difficult to prove, in any particular inſtance, the infection may not have been communicated, by means of ſome other body, from the deceaſed to the ſound ſubject. It muſt, nevertheleſs, be allowed, that ſome contagious diſeaſes are tranſmitted by the air; but on nice examination of facts, we ſhall have reaſon to conclude them much fewer than are generally allowed: and that, perhaps, we have no competent proofs of any caſe, where the open air has been the vehicle. Though there are many clear caſes, where air long confined in cloſe places, or depraved by the reſpiration of too great a number in the ſame room, has conveyed the infection of ſuch diſeaſes.

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ing cattle with the diſeaſe, ſhew this fact with greater certainty of proof. The preciſe limitation of period, in which the infecting matter will keep its power, is not, however, well aſcertained by any obſervations, or trials: but there is room to conclude, that, under ſome circumſtances, it will act at a conſiderable diſtance of time from its being generated. We ſee the variolous matter will communicate the ſmall-pox after many months: and there is no foundation for any doubt of the analogy betwixt the contagion of that, and of the murrain in this particular. But it is a matter of great conſequence, that this ſhould be decided by adequate experiments. Becauſe the knowledge of it is of great moment, in judging of the proper means, and regulations, for preventing the introduction of the contagion into places free from it.

The ſpace of time, likewiſe, betwixt the beaſts receiving the infection, and the perceptible effects of it, is not yet preciſely ſettled by accurate obſervations. But there are well known facts, that give us a conſiderable degree of information with regard to it. In general, appearances will be found in three or four days: in ſome few inſtances, they may not come on till ſix or ſeven. We may ſtate the latter time as the utmoſt period, unleſs when the beaſts are very ſlightly affected with the diſeaſe: and then, where the

ſymptoms may not be diſcernible till it be in its moſt powerful ſtate, ten days may be allowed. If a beaſt, therefore, ſuſpected to have received the infection, do not ſhew any ſigns of it in ſix or ſeven days, there will be very little danger of its being ſeized: and if none appear in ten, it may be taken for granted, that there is no infection in the caſe.

The time for detaining cattle in any place, to which they have been removed, after their having been expoſed to a riſk of the infection, in order to prevent their ſpreading the diſeaſe to other parts, may be, therefore, limited to a fortnight. Since there is not the leaſt hazard, after ſuch time, of their being ſeized with the diſeaſe, in conſequence of their having been expoſed to the contagion ſo long before.

Theſe are the general facts, and obſervations, reſpecting the murrain, which have hitherto preſented themſelves. It is proper to ſubjoin, that, as before intimated, this diſeaſe has various appearances, ſymptoms, and degrees of mortality, at different times, and in different places: as the epidemical effects of the ſeaſons, or endemical circumſtances of particular countries, have interfered with the natural proceſs of the diſeaſe.—In the United Provinces, a profuſe *diarrhœa*, or looſeneſs, is a very common ſymptom; and generally carries off the beaſts by exhauſt-

ing their ſtrength: but, where they do recover, it ſeems to be the critical evacuation, by which the *virus* of the diſeaſe is diſcharged. Eruptions more rarely attend the murrain in that country: though they are not always wanting.—On the contrary, in Great Britain, the looſeneſs ſeldomer happens; and is moſtly a mortal ſymptom: though, in ſome few caſes, a ſalutary one. Eruptions occur much more frequently; and are generally the critical depoſit of the *virus*, when the beaſts recover.—In Denmark, the diſeaſe, when it made its furious attack in 1759, was far more violent and mortal than it was ever known in England or Holland; or than it had been when it infeſted the ſame places before. The fatal criſis was then very rapid: the beaſts dying in two or three days, and ſome ſooner, after they firſt appeared to be affected. At ſome periods, remarkable bliſters on the tongue are related to have been an early and general ſymptom of this diſeaſe *: they are not

* There is, as was above obſerved, another contagious diſeaſe of the cattle, of which bliſters on the tongue ſeem, from the accounts of it, to be a conſtant, principal, and characteriſtic ſymptom: and proper care, therefore, ſhould be taken to avoid confounding this diſeaſe with the murrain, either in reading, or practice. It appears to have been curable, in moſt ſubjects, ſolely by opening the bliſters; and is, therefore, evidently of a much leſs malignant nature than the murrain: in which, as is well known, from many trials, that operation

near ſo frequent now; and only found at, or towards the end of the diſeaſe. Like variations are, as above intimated, ſeen in other malignant contagious diſeaſes; and render an accurate obſervation of the ſymptoms, when they break out freſh at a diſtance of time, neceſſary to the forming a juſt deſcription of them, in order to the diſtinguiſhing them, with certainty from others which are ſimilar.

As the mortality of cattle occaſioned by the murrain has been a very great evil to many countries, means of the prevention, or cure of it, have been earneſtly ſought after by great numbers of phyſicians, and others. But this reſearch has been made with very little ſucceſs any where, either with regard to the intereſt of the proprietors of the cattle, or benefit to the public *; except what

would be of very little avail. This circumſtance alone would give a ſufficient criterion for diſtinguiſhing the one from the other.

* The enumerating the various methods hitherto tried, for the prevention or cure of the murrain, though they were attended with ſo little ſucceſs, may yet be very beneficial, in order to deter from the future vain trials of, or dependance on them, in caſe, as there is too much reaſon to dread, the diſeaſe ſhould be again brought into our country. For, by knowing they are of no avail, though recommended by writers the moſt likely to be conſulted, much needleſs trouble and expence may be ſaved; and the public attention tranſferred from them to more rational and efficacious means, by ſhewing they ought to be exploded as well on account of reaſons drawn from juſt ſpeculations, as a large actual experience of their failure.

relates

relates to the introduction, or ſpreading of the infection, into places, or countries free from it.

Among the means of prevention of the murrain, thoſe the moſt generally adopted, though the leaſt effectual to the end, have been the attempts to render the places where beaſts are kept, or the beaſts themſelves, inſuſceptible of the infection.—In this intention, by an imitation of what the antients recommended, and practiſed, as preſervatives againſt the plague, fumigations, ſcents, and external medicaments employed on the cattle, have been almoſt every where uſed.

With reſpect to fumigations of the places where beaſts are kept, all confidence in them muſt fall to the ground, whenever the opinion of the air's being a vehicle of the contagion is refuted: as they were performed with a view to deſtroy the putrid effluvia with which it was ſuppoſed to be impregnated; and which was conſidered as the matter of the contagion.—But theſe fumigations frequently repeated, as they were for this purpoſe, in cloſe places where the beaſts were confined, were not only ineffectual to that purpoſe, but noxious in a conſiderable degree: as being very conducive to the prevalence of the contagion. For, being in general made with bodies, that afforded an acrid ſteam, ſuch as ſulphur, vinegar, tobacco, or terebinthinate ſubſtances, they injured the

reſpiration of the beaſts; and thence diminiſhing the animal ſtrength, rendered them more diſpoſed to be affected by the contagion. A multiplicity of facts confirm the truth of this remark: as it appears from nearly all the accounts given, that the greateſt number of beaſts have been loſt, where means of this kind have been moſt employed.*

The medicating the cattle externally, by rubbing them with ſulphur, gunpowder, tobacco-water, and other ſubſtances, do leſs harm than the fumigations; but not more good: as experience has largely evinced. The ſame may be ſaid of thoſe extraordinary mundifications, or cleanſings of the hair, and ſkin of the cattle, which have been recommended, and practiſed, on the ſame au-

* A free reſpiration of freſh undepraved air is eſſentially neceſſary to the ſtrength of the beaſts, in order to their reſiſting the effects of the contagion. It has appeared, from a number of obſervations, which are recorded by the writers on this ſubject, that the cattle, which have been kept out in the air, when the weather was not inclement through too much cold or moiſture, have been leſs ſubject to take the infection, and recovered in greater numbers when ſeized with it, than thoſe which were houſed.—In Denmark, during the terrible viſitation, mentioned above, of this diſeaſe in the year 1759, many of the boors attempted to preſerve their cattle from the infection by the fumes of tobacco: which they continually ſmoked in the cow-houſes, even ſitting up the whole night in turns, for that purpoſe, in the midſt of them. But it was remarked, that ſcarcely any of the cattle ſo treated, avoided the contagion, and death in conſequence of it.—

thority

thority of the antients.—There is reaſon to conclude, that the contagion, in whatever it is firſt imbibed, takes effect too ſoon to be rubbed off in time: and it is moſt reaſonable to ſuppoſe, if the infection be at all, abſorbed by the ſkin, this great cleanſing of it, may fit, and prepare it, to receive the contagion, rather than defend it againſt its admiſſion. All the ſuppoſedly preſervative methods of this kind, though they have the authority of many writers, from an implicit ſubmiſſion to the more antient, have been found as vain and fruitleſs in practice, as they ſeem abſurd in ſpeculation, when examined on the juſt and demonſtrable principles of phyſiology.

The uſe of the internal medicines adminiſtered, as antidotes, to fortify the beaſts againſt the attacks of the contagion, have been equally inefficacious, or detrimental, with the external means. — Thoſe of the medicines, that have been recommended for this purpoſe, which come within the claſs named alexipharmic, and are propoſed to combat the *virus*, are intirely inadequate, in their degree of power, to the intention: though ſome of them, by their invigorative qualities, may have a tendency to oppoſe the effects of the contagion.—— Thoſe, which have been adopted as antiſeptics, or reſiſting putrefaction, ſuch as ſul-

phur, oil of vitriol, vinegar, &c. when given as preſervatives againſt the contagion, muſt of courſe be adminiſtered out of ſon. Since putrefaction in the fluids o beaſt is the conſequence, not the cauſ the contagion; and, therefore, cannot place till the contagion be received: nor, as it did not before ſubſiſt, can it admit of being counteracted till then. Moreover, the ſubſtances of this kind, which are of an acid nature, have, in this caſe, a contrary tendency to that of reſiſting the effects of the contagion. For, deſtroying the bile, and checking, by other means, the digeſtive ferment, as well as lowering the *vis vitæ* from ſome other leſs known power, they weaken the habit of the beaſts; and, conſequently, diſpoſe them to receive the infection more readily; and ſuffer, with leſs reſiſtance, its action in bringing on a putreſcent ſtate of the fluids. It has been, therefore, every where found, that whenever any of theſe methods have been perſued, more beaſts have been loſt than when they were left to the friendly aſſiſtance of nature, undiſturbed; and only ſecured from thoſe accidents, that would injuriouſly affect their health in all circumſtances.

There is another propoſed method of ſaving cattle from the mortal effects of the murrain, of which ſome trial has been made, that properly comes under conſider-

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ation, along with the preceding. Becauſe, though it is not, indeed, the preventing the [illegible]tion, but, on the contrary, the giving [illegible]et it is calculated to anſwer the ſame [illegible] that is, the preventing the ill effects of [illegible] contagion by anticipative means. This method is, the inoculation of the cattle with the murrain, in the ſame general manner, as is practiſed with mankind for the ſmall pox. The fact is well known, that beaſts, which have had the murrain, from accidental infection, like mankind, with regard to the ſmall-pox, do rarely take it again: and, it being preſumed on this ground, that the analogy betwixt theſe two diſeaſes ſtill holds good in other particulars; and, conſequently, that the communicating the murrain by inoculation would have the ſame conſequences, on the cattle, in preventing their receiving the infection again, and in rendering the ſymptoms of the diſeaſe proportionably milder, and leſs fatal; it was imagined, the uſe of this method might be, in a conſiderable degree, a ſubſtitute for a preſervative from the infection itſelf. But experience has evinced, that this preſumption was erroneous in point of fact: and there is, beſides, one eſſential circumſtance of difference betwixt the murrain and the ſmall-pox, which conſtitutes the uſe of inoculation detrimental in the former, even if it were productive of the ſame conſequence, as

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in the latter, with reſpect to the mitigation of the ſymptoms, or the prevention of future infection.—The experiments made to explore the effects of inoculation in the murrain, though not all alike in their reſult, have yet given ſufficient lights to determine, that they are very different from thoſe of inoculation for the ſmall-pox: and that it can, in no degree, anſwer the ſame end, even with reſpect to the particular beaſts ſubjected to it: much leſs can it conduce to the reſtraining, and diminiſhing the mortal effects of the contagion, in any manner, that may be beneficial to the public.

In the firſt place, it is ſufficiently proved from inſtances, that the inoculation of beaſts for the murrain does not hinder their receiving the infection again, as other cattle, by accident. This may ſeem very extraordinary, on the firſt view: becauſe, when the cattle take the infection by caſual means, and recover, they are rarely ſubject to have the diſeaſe a ſecond time: and becauſe, we ſee inoculation for the ſmall-pox prevents the ill effects of future contagion, in the ſame manner as a caſual infection. But reaſons drawn from analogy, however juſt they may be in ſupport of ſuppoſition, cannot cancel facts: and though the cauſe of this difference betwixt the ſmall-pox, and murrain be of a dark and inexplicable nature, yet nothing

nothing is to be thence inferred againſt its reality, as the ſubject itſelf is ſo, in all reſpects. For there has been no ſatisfactory reaſon hitherto aſſigned, why the having either of theſe diſeaſes once, by any mode of infection, ſhould be preventive of the future effects of the ſame contagion.—Whatever difficulties may attend the accounting for it, we yet find, on a reviſal of the relations of the trials of inoculation, practiſed for the murrain, a conſiderable number, in proportion to the whole, are known to have actually taken the infection afterwards: and that of theſe, the far greateſt part died of the diſeaſe *. We may, alſo, reaſonably pre-

* There are many inſtances of cattle taking the murrain a ſecond time, after having juſt before had it by inoculation.

Noſeman, and two other Dutch phyſicians, were among the firſt, who performed this operation in Holland. The beaſts, they inoculated, were ſeventeen in number: and, out of them, three recovered; but took the infection again by accidental means, a fortnight after, in ſo violent a manner, that two of them died.

Profeſſor Graſhuys inoculated ſix beaſts, which recovered. All of them took the infection again by accident: and four of them died.

There is an account, in the experiments of the Marquis de Courtivron, of two calves, that were inoculated twice without any apparent ſymptoms of the diſeaſe being produced. But they took the infection without any operation, afterwards, from other cattle, having the diſeaſe from inoculation: and one of them died.

In an experiment made laſt year, on the inoculation of cattle for the murrain, in conſequence of a ſubſcription formed for that purpoſe in Friſeland; and reported

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ſume thence, that others of them might take the infection after the accounts were written; or under circumſtances, which, might prevent the writers from attaining to the knowledge of it. It muſt, likewiſe, be conſidered, that among the beaſts inoculated a part muſt have been ſuch as were not conſtitutionally ſuſceptible at all of the infection, by caſual means; and, therefore, did not take it afterwards on that ſcore.—But, if we reaſon on the ſimple fact alone, that a conſiderable proportion of the number of the beaſts inoculated have had the diſeaſe again; and with at leaſt equal violence and

to the States-general of the United Provinces by profeſſor Camper, it appears, that, out of ten, which recovered after being inoculated, the 5th of July, five took the diſeaſe again by accidental means; and all died.

In the continuation of the above experiments, ſeven beaſts, which recovered, after being inoculated July 20th, all took the infection again caſually afterwards; and were carried off by the diſeaſe.

It may ſeem difficult to conceive why more of the cattle that have recovered from inoculation, and taken the diſeaſe afterwards, ſhould die of it, than of thoſe which have not been inoculated, and are caſually infected with it. But as inoculation does not, ſimilarly to what is found in the ſmall-pox, prevent the future action of the contagion with equal power; nor render the ſymptoms leſs violent, when the diſeaſe is received by that mode of infection, than when in the natural way; there is room to conclude, that the weakened habit of the beaſt, in conſequence of the injury done by the diſeaſe in the inoculated ſubjection to it, renders the effects more fatal in the ſecond attack, according to the principle we have above ſpecified.

mortality

mortality, as thoſe not before inoculated; we muſt grant, that this practice cannot any way anſwer the end propoſed: which is ſolely, that of preſerving them, for the future, againſt the bad effects of the contagion.

In the ſecond place, it is, likewiſe, evinced, by the ſame teſtimony of facts, that the infection communicated by inoculation is not attended with leſs violent ſymptoms, and mortality, than when received by caſual means. The accounts of the practice of that operation fully juſtify this aſſertion *.

* There are many inſtances, in the relations given of the trials of inoculation for the murrain, of the beaſts dying in a great proportion to the number ſubjected to it. Amongſt them are the following:

Noſeman, and his two collegues, as we have before had occaſion to mention, inoculated ſeventeen; of which fourteen then died: and two of the others, which had recovered from that infection, took a freſh one caſually; which appeared ſtronger, and carried them off. So that only one was ſaved out of the ſeventeen.

Doctor Fountayne, dean of York, had four inoculated; and loſt one of them.

Doctor Layard inoculated eight beaſts: of which five died: and he killed another for inſpection; which, otherwiſe, might have been added to them for any thing that appears.

Four beaſts were inoculated for the murrain, in the ſpring of laſt year, by order of the States of Utrecht: all which had the diſtemper with great violence; and died: as appears in the report, made to the ſtates of that province of the opinion of ſome eminent phyſicians, they conſulted; and of the reſult of this experiment.

The following numbers died from the inoculation performed in conſequence of the ſubſcription abovementioned in the note, page 395, made laſt year for that purpoſe

Hence, therefore, as well as for the aforementioned reaſon, inoculation appears evidently to fail of its intended purpoſe.

purpoſe in Friſeland. — Out of twenty-five head of young cattle inoculated, the 5th day of July, ten died: beſides the five others, which, though they recovered, took the diſeaſe again afterwards caſually; and, then died of it, as before related.—Out of twenty-five that were inoculated, the 20th of July, thirteen then died: beſides the ſeven before-mentioned, which having recovered, caught the infection by accidental means afterwards, and were carried off by it.—Out of fifty-eight that were inoculated, the 9th of Auguſt, and took the infection, twenty five died of the diſeaſe then: and five more died ſoon after of a pulmonic decay occaſioned by it.—Four other beaſts were inoculated, on the ſame 9th of Auguſt, in which the infection failed. They were again ſubjected to the operation, the 18th and 19th, in a ſimilar manner; and, taking the diſeaſe then, two died at the time; and a third ſoon after, from pulmonic abſceſſes brought on by it.

In theſe inſtances taken together, we find a far greater proportion of the cattle, deſtroyed by the murrain given by the inoculation, than would have been by the infection taken in the natural way.—Profeſſor Camper ſays, nevertheleſs, "That ſuch ill ſucceſs ſhould not diſcou-"rage the future purſuit of inoculation for this diſeaſe: "becauſe the ſame miſcarriages happened on the firſt "introduction of this operation for the ſmall pox into "our parts of the world." But I muſt beg his pardon for ſaying, that this is an inadvertent aſſertion: and that he is entirely miſtaken in the matter of fact. For the inoculation for the ſmall-pox was equally ſucceſsful at firſt as now: and though extraordinary ſtreſs has been lately laid on ſome particular methods of treatment, ſuppoſed to be new; yet, where they have not been followed, we have two inſtances of a greater liſt of recovered patients, in proportion to thoſe which have been loſt under the ſame conduct, than can be produced on equal authority, by any of the pretended improvers

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the total inſufficiency of inoculation to anſwer, in the caſe of the murrain, the end propoſed, on the ſcore of both the preceding circumſtances, would be a ſufficient ground for exploding the practice of it. But there is a yet ſtronger reaſon againſt its uſe; which ariſes from this principle.—The murrain is, at leaſt with reſpect to the European countries, an epidemical diſeaſe, though contagious. That is, it does not, as we have obſerved before, ever reign, but when certain unfavourable circumſtances of ſeaſon have created a prediſpoſition in the cattle to receive the infection; and thence rendered them temporarily ſuſceptible of it. When the effects of theſe unfavourable circumſtances of ſeaſon ceaſe, the effects of the contagion ceaſe likewiſe; as far as regards accidental infection: ſo that, when the conſequences are left to the natural courſe of things, this diſeaſe is only a temporary miſchief, to which there is ſome certain period*.

of this practice. Some few, out of great numbers, have, at all times, died of inoculation for the ſmall-pox: but never, in any proportion to the beaſts, which appear in the relations here cited, to have died from inoculation for the murrain. It was the ſtriking examples of ſucceſs, which could alone have introduced and eſtabliſhed the uſe of inoculation for the ſmall-pox here: and it would have been rejected with horror, and prohibited by authority, had a ſimilar failure to that, which has been experienced in the murrain, been found in the reſult of the firſt trials.

* Profeſſor Camper, and ſome others of the Dutch phyſicians,

though that period may be different, as we have ſeen above, from the various condition

phyſicians have given it as their peremptory opinion, that the murrain will not ceaſe entirely again in their country; but, like the ſmall-pox and meaſles, only abate its violence, and confine itſelf to particular places in favourable ſeaſons. The profeſſor ſays in one paſſage of his printed Eſſay, "That it is more than probable, this contagious diſeaſe is become as permanent "as the ſmall-pox and meaſles." But certainly this notion is very erroneous, and contrary to a rational and juſt deduction from facts.—There are no parts of Europe which the murrain has been known to have ever invaded, that have not been known at other times afterwards to have been again free from it. A conſiderable ſtreſs may be properly laid on the more antient viſitations of many places, of which we have accounts, whence it muſt often have gone away, as there were no traces of it found afterwards in them. Why, then, if there be any thing in the nature of the contagion, that renders it capable of eſtabliſhing itſelf permanently, has it not been found to have done ſo in ſome places or other? Yet no ſuch place is known where this murrain has always ſubſiſted, from a conſiderable time backwards to the preſent. Even the United Provinces themſelves, where the contagion's having now maintained itſelf for a number of years, laſt paſt, has given occaſion to this apprehenſion of its having become perpetual there, was become again clear of any remains of that infection, which was brought into the country at the time of the general diffuſion of it over all Europe, about the year 1713; and continued its force there till about 1721. It will be allowed, that not the leaſt marks of this diſeaſe appeared during an interval of near twenty years, till it again was brought by a freſh contagion, about the year 1742, which can be traced to have come from a very diſtant part of Europe; and paſſed through the ſame countries as the former contagion of 1713. The profeſſor himſelf acknowledges theſe facts in other paſſages; and includes the United Provinces

of different places. Now, if the inoculation for the murrain were practiſed in ſo general and continued a manner, as to render it of any public conſequence, ſuppoſing the inoculated beaſts incurred leſs danger from the

provinces in the parts of Europe where he ſays, it was no more heard of till 1740. Now, if after raging ſo violently in the United Provinces in 1713, and 1714, as to carry off 40,000 head of cattle in leſs than two years, and keeping its ground for more than ſeven years, it then, entirely ceaſed; if it has, moreover, ceaſed in like manner, at various periods, in every other places where it has been known to have ſubſiſted; what reaſon can we have to conclude, that it will now be perpetual; or, to uſe the profeſſor's own expreſſion, permanent, like the ſmall-pox, and meaſles; which have never been found to quit any conſiderable tract of country once infeſted with them, though ſome ſmall diſtricts may be at times exempt from them.—The preſent extrordinarily protracted continuance of the murrain, in Holland, is eaſily to be accounted for from a longer ſeries than common of unfavourable ſeaſons, conſpiring with the great relaxation natural to the cattle in ſo damp a country: which has kept them in a ſtate ſuſceptible of the infection at the ſame time, that, in other neighbouring countries, of a better temperature, this prediſpoſition to the diſeaſe has not equally prevailed. But this peculiarity in the ſtate of the ſeaſons muſt, nevertheleſs, undoubtedly have ſome period; and, conſequently, the prevalence of the contagion. The effect muſt ceaſe in the United Provinces, as well as in other countries along with the cauſe; as it has manifeſtly always done before: and the diſeaſe, therefore, cannot be preſumed to be rendered perpetual, or permanent as the ſmall pox, or meaſles, unleſs the continuance of the unfavourable ſeaſons, ſuch as have ſucceeded each other ſince the year 1740, be previouſly preſumed to be rendered perpetual: which is againſt the courſe of nature; as diſplayed in all preceding times.

diſeaſe by that mode of receiving the infection, and were more ſecure from future attacks of it, the contagion muſt be ſpread in proportion to the extent of the country where the operation is practiſed; and muſt, alſo, be conſtantly kept up in good as well as bad ſeaſons. Hence all the natural means of the contagion's being exterminated, in the favourable times, would be wholly taken away: and, in the bad times, there would be neceſſarily a great deſtruction of ſuch beaſts, as neglect, or the caſual want of opportunity of inoculation, had left expoſed to the rage of it. This we ſee happen at preſent with us, in the inſtance of the ſmall-pox, from the very extenſive diſſemination * of the infection by inoculation. But this diſeaſe differs very materially from that of the murrain, with relation to that operation. For we find no

* It is certain, from a very attentive examination of this matter, that a far greater number of perſons have died of the ſmall-pox in England within the four or five years laſt paſt, than have ever been known within a like period, for a conſiderable length of time. The inoculation of numbers, in almoſt all places, has diffuſed the infection through every corner of cities, and large towns: and the itinerant practitioners of the operation have conveyed it into every village of the country, even ſome, where it had ſcarcely before ever been known. By this means, all perſons ſuſceptible of the infection having been expoſed to it, during a bad epidemical conjuncture, many have of courſe taken the diſeaſe; and been carried off.

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inſtance of the contagion of the ſmall-pox being ever totally ſuppreſſed in any country, where it has once gained admiſſion: and, therefore, if general inoculation mitigate the effects, it may be adopted for that diſeaſe without the miſchief of cauſing a perpetuity of the contagion; as would happen from a general practice of it for the murrain: the contagion of which will, otherwiſe, ſpontaneouſly ceaſe in certain periods; as paſt events have inconteſtibly manifeſted.

The failure of inoculation to anſwer its intended purpoſe, as evinced by the inſtances above quoted, and others, has diſpoſed the favourers of it, not to inſiſt on its utility, when practiſed on cattle in general. But Camper, De Monchy, and ſome others of thoſe, who have moſt lately given opinions on this ſubject, ſtill continue to recommend it to be performed on calves, or young cattle. But even admitting a greater number of them than of older cattle, might recover, when ſubjected to it; yet, if it be not, as we have above ſhewn good reaſon to believe, a ſecurity againſt future infection, it can be of no utility. The objection, moreover, againſt the general uſe of inoculation, with regard to its ſpreading and perpetuating the contagion, avails equally againſt the inoculation of the calves, as the adult beaſts. For what will ſecure the other

cattle from this infection, when the calves have the diſeaſe in places near them? Will not this univerſal propagation of the contagion, in ſpite of all the care that can be taken, of courſe occaſion its frequently reaching ſome of the older cattle: and will they not infect each other the ſame as at preſent, only in a more general manner? It may be anſwered, that, if all the calves be inoculated, the whole ſtock of cattle would in time be rendered inſuſceptible of the infection; and therefore not ſubject to this miſchief. But if, which is, nevertheleſs, denied, for the reaſons before ſpecified, the inoculated cattle were rendered incapable of having the diſeaſe again; yet the detriment ariſing from the above explained effects of ſuch a practice, before it could poſſibly be extended in any general manner; and the impracticability of making more than a part of the people conform regularly to it; would be extremely great. This plan has, beſides, the further inconvenience of being incompatible with any ſupply of foreign cattle in places of great ſcarcity †. For the contagion being ſpread every-where by

* The want of a recruit, from other places, of the ſtock-cattle has been ſo great in Holland, that the deſtruction of the breed, and an extreme great ſcarcity of proviſions, muſt have followed, if there had been no ſupply of foreign beaſts. At preſent there is a moſt viſibly deplorable deficience of the ſtock, notwithſtanding the great numbers, which have been lately brought from Holſtein.

the conſtant inoculation of the calves, ſuch foreign cattle would of courſe be affected by it: which muſt produce ſuch a loſs to the dealers in them, as would deter any perſons from venturing on ſo dangerous a trade: whence the public diſtreſs would be greatly inhanced, by the ſcarcity of all cattle, thus occaſioned.

We may, on the whole, conclude, that no general effectual aid is to be obtained againſt the murrain, in a *preventive* intention, by medicinal means. For ſuch as might avail to a certain degree, in nature, are rendered impracticable from œconomical reaſons. Whatever is done of this kind to anſwer any real purpoſe, muſt be extended to all the cattle in every ſtock; at leaſt, where there are not very particular ſigns of ſtrength; which will be found only in few. It muſt, alſo, be continued, or at leaſt renewed at ſhort intervals, during the whole time the infection is in the neighbourhood: as no foreſight can point out when accident may convey it to the beaſts. This muſt cauſe much expence in the purchaſe of the medicines; and conſtant trouble in the adminiſtration, which is in fact equal to expence.

Holſtein. This circumſtance alone is a ſufficient objection to the propoſal of inoculating calves: as ſuch a ſtock, as could be thence raiſed, would by no means be adequate to the conſumption; and the limitation of it would render the price of beaſts exorbitant, and burthenſome.

Profeſſor Camper ſays, nevertheleſs, that nothing affords a greater proſpect of ſucceſs than preparing the humours while the cattle are yet in health, as the contagion approaches. But he ſeems aware, however, that the medicine which could be moſt depended upon for this purpoſe, the Peruvian bark, would be too dear to be adminiſtered in that profuſion, which is neceſſary: and therefore, he propoſes the finding ſome ſubſtitute for it; intimating, that he conſiders the willow-bark as ſuch. But, unhappily, it is well known, that neither the willow-bark, nor any other hitherto diſcovered ſimple, is an adequate ſubſtitute for the Peruvian bark: and, though they have a degree of the ſame power; and may be joined with it to make ſome ſaving of the quantity; yet, given alone, they are not to be depended upon, and deemed equal to the intention. The expence of the Peruvian bark; or of ſtrong-fermented liquors, or cordials; the only efficacious means of invigorating, and keeping up the ſanative ſtrength of the beaſts, would be apparently more burthenſome to the proprietors of cattle, than that of replacing ſuch of them, as might be carried off by the diſeaſe. Since, to put a large herd of cattle under a medicinal regimen, and continue it ſo for a long time, would moſt obviouſly be attended with a certain great loſs, for the precarious

ſerious chance of avoiding another loſs, that, at worſt, could not be equal to it; nor, poſſibly, incurred at all; and would, therefore, be neither advantageous, nor in general practicable: as many proprietors of cattle could not find reſources for making ſo conſiderable a diſburſement.

The remedies, which have been tried for the *cure* of the murrain, have been in general as inefficacious, and abſurd, as thoſe employed for its prevention: and, though ſome few have been better choſen with reſpect to the intention; yet they never appear to have been well uſed as to the manner of adminiſtration: whence we have very few certain inſtances of their ſucceſs. — The far greater part of theſe medicines, like thoſe uſed for the prevention of the diſeaſe, have been taken up on the authority of the antients, and the earlier writers; and conſiſt of a jumbled variety of thoſe medicaments, which are deemed antidotes of poiſons, or alexipharmics. Under this claſs, have been given theriaca, mithridate, diaſcordium, opium, camphor, balſams, frankincenſe, myrrh, juniper-berries, camomile-flowers, marygold-flowers, feverfew, rue, ſage, fenugreek, madder-roots, graſs-roots, horſe-radiſh, bay-leaves, muſtard-ſeed, ſnake-root, contrayerva-root, turmeric, ſavin, moth-maſſein, ſpear-mint, calamus aromaticus, garlic, onions, leeks, teſtaceous powders, ſulphur, vinegar,

vine-ſtalks, honey, raiſins, figs, blood of a tortoiſe, and eggs *.—Some preſent phyſicians, on more modern, but perhaps not more juſt notions, have exhibited, to the beaſts, ſeveral of the above, and other ſimples, under the name of antiſeptics; in another intention: it is, that of reſiſting putrefaction; in which they principally place the cauſe of this diſeaſe. The chief of the remedies of this claſs, they have adopted, are the vitriolic acid, vinegar, verjuice, ſour dough, butter-milk, common ſalt, and ſal ammoniacus †.—Others, who are attached

* The notion of the nature and properties of antidotes, was very vague, and void of ſcientific principles, in the antients: and the choice of their medicaments of that claſs, were accordingly, in many inſtances, abſurd, and incongruous.—The general idea of what were called *alexipharmics* was more rational, and juſt; but the particular medicaments, adopted in this view, were, for the moſt part, very inadequate to the intention, even in ſlighter caſes; and very injudiciouſly combined with each other in the compounds.—It is not to be wondered at, therefore, no remedy againſt ſo malignant, and violent a diſeaſe, as the murrain in cattle, ſhould be found amongſt thoſe of this claſs propoſed by the antients, or their followers.

† The *antiſeptic* claſs of medicines has not much more claim to propriety and efficacy, in the cure of the murrain, than that of the antidotes, and alexipharmics.—Though a putreſcent ſtate of the fluids be the conſequence of this diſeaſe in the ſecond ſtage, when the effects are violent; yet it does not ſeem to have any concern in the cauſe; nor, from any marks, even to come on in the firſt ſtage.—The effectual method, therefore, of doing ſomewhat, that may reſiſt the putrefaction, is to mitigate the violence

to the doctrines of another modern ſchool, conſidering this diſeaſe as inflammatory, have adminiſtered medicines, they hold as emollient and ſedative; of which nitre, cream of tar-

violence of the diſeaſe: which can be only effected, as far as hitherto appears, by keeping up the natural ſtrength of the beaſts, through the uſe of an invigorative regimen.——The action of thoſe remedies called antiſeptics, may be, therefore, well doubted, as we ſhall have occaſion to take notice more particularly below, with reſpect to their *immediate* effects in that intention, in any febrile caſes, and more eſpecially in the murrain.—Notwithſtanding they check putrefaction in inanimate animal ſubſtances; yet, in living ſubjects, being taken into the inteſtines, their nature is changed by the digeſtive operation: and they do not paſs into the habit with the ſame qualities; but as a part of the chyle, in which ſuch qualities cannot exiſt.—Thoſe of them that contain the aſtringent gums, which have the property of tanning, ſuch as are found in the Peruvian bark, &c. may promote this intention, indeed, *ſecondarily*, by invigorating the ſolids; accelerating, conſequently, the motion of the fluids; and thence aiding the natural ferments, which are the cauſe, why putrefaction does not take place in the juices of the living animals. But the acid kinds of the antiſeptic medicines have, even, the contrary effects in febrile caſes. For, diminiſhing the irritability, they lower the *vis vitæ*: and they prevent digeſtion, by checking that particular ferment by which it it is performed. Whence, in both ways, they leſſen the animal ſtrength; and, of courſe, conduce to the putreſcence of the humours.—Theſe antiſeptic remedies, moreover, can have no effect on the habit, in that ſtage of the diſeaſe, where the putreſcence actually takes place. Becauſe the digeſtion is then totally loſt, as we ſhall ſee below; and the medicines, when taken, either remain in the ſtomachs of the beaſts; or paſs off in a colliquative purging. It is thence, we may account for the greater mortality of beaſts ſo treated.

tar,

tar, acids, mucilages, and oils are the principal *.—Mercurials, antimonials, and white

* How far the notion, that the mortal effects of febrile diſorders in general depend on inflammation, and that the indications of cure are to be thence deduced, may be juſt, does not make a proper object of examination here: though, perhaps, a medical error in this point, has not only been deſtructive to many cattle, in caſes of trials to cure the murrain; but to a greater number of mankind than were ever ſaved by all the means of medicinal art. But, however that may be, it is obvious, the murrain cannot be claſſed amongſt inflammatory diſorders, when the ſymptoms of it, that will be below inveſtigated, are duly conſidered. It muſt be allowed, indeed, that when the whole animal œconomy is perverted by this diſtemper in the ſecond ſtage of it, the efforts of nature, to relieve herſelf from the diſcraſy of the fluids, produce inflammations in particular parts: the marks of which are conſtantly found. Inflammation is not, however, in the murrain, even the ſecondary cauſe of the diſeaſe itſelf, as it is in the ſmall-pox, plague, and ſome other febrile contagious diſtempers of mankind; but the laſt conſequence of it, in the moſt advanced ſtate. —On the contrary, the ſymptoms of the firſt ſtage of the murrain, and frequently of the ſecond, exhibit no ſigns of general inflammation, but of general and partial weakneſs. A lentor of the animal action, a ſtupor, and a paralyſis of the head and digeſtive organs, are, as we ſhall ſee below, the firſt viſible effects. Where theſe are aggravated, ſo as to prevail over the efforts of nature to perform the vital functions, the diſeaſe neceſſarily proves fatal: but where the animal ſtrength is ſufficient to reſiſt for a certain period, the diſeaſe terminates by a critical diſcharge of the *virus*, or morbid matter; and the beaſt recovers. Certainly, therefore, the treating the murrain as an inflammatory diſorder, by the exhibitions which diminiſh irritability, and leſſen the *vis vitæ*, or animal ſtrength, is conſpiring with the efforts of the contagion to bring on the deſtruction of the beaſt: as thoſe efforts prevail according to the weakneſs of the ſubject. It muſt

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vitriol have, alſo, been employed, in the intention of febrifuges, by ſome of the preſent phyſicians, who are favourers of chemical and metallic medicines *.

But alike has been the ſucceſs of all the propoſed remedies of theſe ſeveral claſſes: which is, that a remarkably great number

be admitted, indeed, that the medicines adminiſtered in this intention are not very powerful in their effect: but when conjoined to bleeding, or other evacuations, they have ſome ſhare in rendering nature unable to reſiſt the action of the contagion. They may, conſequently, be granted to have contributed, in ſome degree, to that remarkable loſs of the cattle, which has attended the attempts to cure the murrain.

* The trials of mercurials, as ſpecifics for the murrain, were ſuggeſted by their efficacy in the venereal diſeaſe; and, perhaps, in ſome others, which are contagious. But it does not appear, from any obſervation on facts, occurring in the trials made on it, to avail in the murrain. Indeed, had it been of more virtue in this diſeaſe, the effects of it, in the manner it has for the moſt part been adminiſtered for the ſame, muſt have been but ſlender. In the æthiops mineral, and cinnabar, which are the preparations uſed, the mercury is ſo clogged, and locked up by its combination with the ſulphur, that its action is weak and precarious.—As far as can be concluded from analogy, the antimonials might poſſibly have had ſome effect in this diſeaſe, if the proper kind had been adminiſtered on the firſt appearance of the ſymptoms. But, at the time theſe medicines ſeem moſt to avail in fevers of the human kind, that is in the laſt ſtage, they cannot poſſibly be of any ſervice in the murrain. Becauſe the digeſtion is then, as we ſhall ſee below, intirely loſt in all the particular ſubjects, which would not recover without any aid; and the medicines muſt, therefore, with them, lye inactive in the firſt ſtomach or cud-bag without paſſing further.

of

of the beaſts, to which they have been adminiſtered, have died, in proportion to that of thoſe, which have been left to nature. This may appear ſtrange: but the fact is, that all of theſe medicaments, which have any operation, except thoſe which have an invigorating and ſtrengthening quality, diſturb, in ſome way or other, the animal œconomy; and, thence weakening the beaſts, render them more ſubject to the malignant action of the contagion, according to the principles above laid down.

The Peruvian bark; ſtrong fermented liquors; cordials; and other medicines, which have the ſame tendency to invigorate, and are, thence, as will be ſhewn below, agreeable to the true indication of cure, have, amongſt the reſt, been tried by ſome few phyſicans in their treatment of this diſeaſe. But the manner in which they were uſed, either with reſpect to the period of the diſtemper when they were given;—the want of due perſeverance in the exhibition;—the joining to them injurious practices;—or ſome other circumſtance; has been ſuch, that but few inſtances of good can be ſhewn to have reſulted from them: though enough to confirm what may be deduced from juſt principles of phyſiology, reſpecting this diſeaſe, as to their utility in the cure of it.

Bleeding has been practiſed by moſt, who have attempted to cure the murrain. Many

have

have done it promiſcuouſly, in every period of the diſeaſe: others have confined it to the firſt ſtage only. — Whoever conſiders the effects of bleeding on the habit; and the nature of the diſtemper, as deduced from the ſymptoms; cannot doubt but that this evacuation muſt have largely contributed to augment the extraordinary number of thoſe beaſts, which have died, when ſubjected to medicinal treatment, compared to that of thoſe, which have been left to the favour of nature.—The failure of that degree of animal ſtrength in ſome beaſts, which is found in others, is, as we evidently ſee from the facts above-mentioned, not only the cauſe, why one part of the cattle takes the infection while another eſcapes it; but alſo, why it proves mortal to one part of thoſe ſeized with it, while the other recovers. Now it muſt be allowed, that bleeding, when to ſuch degree as to have any effect, more than almoſt any other means, diminiſhes the animal ſtrength, or the force of circulation. Muſt it not then, in proportion, conduce to bring the ſtrong cattle to that ſtate of weakneſs, which is the cauſe, as we have ſeen above, why the diſeaſe prevails over nature in ſome more than others; and to render ſtill more weak thoſe which were ſo?

It is not to be wondered at, nevertheleſs, that phyſicians, who have haſtily conſidered the

the murrain as an inflammatory diſeaſe ſhould adopt this moſt effectual means

* The notion, that the murrain is an inflammatory diſeaſe, has ariſen from the haſty concluſion of phyſicians, of its being ſimilar and having a great affinity to the ſmall-pox, and plague. But it will be manifeſt, from moderate obſervation on the reſpective ſymptoms of them, that there is no ſuch ſimilarity or affinity betwixt them in nature.—The ſmall-pox always produces general inflammation, and conſequently ſigns of a ſtrong fever, in a greater or leſs degree in the firſt ſtage: and the exceſs of that inflammation is frequently the cauſe of its proving mortal. The ſame is ſeen in the plague, which begins with ſymptoms of ſtrong fever and inflammation. Whence they may both be properly deemed inflammatory diſorders: as inflammation is one principal ſecondary cauſe of the dangerous ſymptoms and mortality attending them.—But, in the murrain, no ſuch inflammation ever appears in the firſt ſtage; but the very contrary: nor does any great degree of heat occur till either towards the middle of the ſecond ſtage, and then only, in the caſe of a diſpoſition to eruptions, when, as Dr. Layard has juſtly remarked, it is a prognoſtic of a recovery; or at the end of the ſecond ſtage, when depoſits of the morbid matter are made on the viſcera; and ſoon induce a mortification. In the ſmall-pox, an eruption is the ſole ſalutary criſis, which nature has inſtituted; and through which, the ſubject can be ſaved. It is, therefore, together with the preceding and attending inflammation, and fever, eſſential to the diſeaſe. But, on the contrary, in the murrain, though eruptions are one mode of the criſis of the diſeaſe; or, in other words, one way by which nature diſcharges the morbid matter, when of due maturity; yet they are often wholly wanting, even when the beaſts recover; and, therefore, not eſſential to the diſeaſe, even where it has its full natural progreſs. For in the United Provinces, and other moiſt and low countries, eruptions are moſt frequently not found in the beaſts which do well: but a diarhæa, or looſeneſs,

reſiſting inflammation: but there is not the leaſt ground for this notion of the nature of the diſeaſe.

In the firſt ſtage, the contrary of general inflammation appears: for then the ſymptoms exhibits ſigns of languor and a diſpoſition to inſenſibility. Nor is there any general inflammation ſeen in the whole courſe of the diſeaſe, except when depoſits of the morbid matter are made in the laſt ſtage: which, if they prove eruptions or tumours in the external parts, are a ſalutary criſis, that ſhould not, on any account, be diſturbed or checked: or, if they fall on the internal parts, are a fatal ſymptom not to be reſiſted; and are then, moreover, attended with ſuch a ſtate of weakneſs in the breaſt, that any conſiderable evacuation muſt ſoon be followed with a mortal ſinking.—At what time, therefore, is the bleeding to be practiſed with a view to the relieving againſt the inflammation? In the firſt ſtage, when there is a total abſence of any ſuch inflammation, and the whole danger of miſchief lies in that of the want of ſufficient ſtrength: or in the laſt

looſeneſs, conſtitutes the critical diſcharge: and, in ſuch caſe, no great degree of heat ariſes in the whole courſe of the diſeaſe.—This proves an intire diverſity in the nature of the diſeaſes, to be betwixt the ſmall pox, and the murrain; and evinces, that the indications of cure, which are adopted from a ſuppoſed analogy of them, ſtand on a very erroneous foundation.

ſtage,

ſtage, when there is ſuch a ſtate of weakneſs, that the evacuation muſt neceſſarily kill the beaſt; or ſuch a critical eruption, as if ſuffered to take its courſe, may ſave the animal; but if checked, or thrown in, by the diminution of the fever, which ſupports it, muſt attack the internal parts; and either cauſe inſtant ſuffocation or convulſions; or, in a ſhort time, a mortification of thoſe parts*? In every light, this evacuation appears to be in-

* Dr. Layard, who, on the whole has written the moſt ſenſibly on this diſeaſe, ſays, "Bleeding, there-"fore, will be found neceſſary, only when the inflam-"mation is ſo conſiderable, and the fever ſo high, that "nature is obſtructed; and cannot expel the morbid "matter: and, whenever ſuch ſymptoms are apprehend-"ed, prudence will require bleeding, to prevent this "coming on, according to the conſtitution, ſtrength, or "age of the beaſt." But I muſt diſſent from the Doctor, as to his opinion, that there are any caſes, which admit of a rule to be laid down for bleeding the cattle in the murrain. That *inflammation* does ever *obſtruct nature, ſo that ſhe cannot expel the morbid matter*, is a mere hypotheſis: and, perhaps, it might be, eaſily ſhewn to be ſuch, as is not conſiſtent with the known principles of phyſiology; I ſhall, however, wave any diſcuſſion of that kind here. It is ſufficient to deny, that any ſuch inflammation is found in the courſe of this diſeaſe: as no ſtrong ſigns of any appear, but the ſhivering, and heat, in the earlier part of the ſecond ſtage, which denote an eruption, and are, as above-mentioned, enumerated by the Doctor himſelf among the prognoſtics of recovery;—or the violent fever, which follows the attack of the diſeaſe on the viſcera in the very laſt period; and is, conſequently, always a fatal ſymptom. But admitting there were caſes, when it might be beneficial to bleed the beaſts, in this diſtemper, with a view to prevent the coming on of too much inflammation, or the conſequences of it, when ſub-

jurious in the murrain. For, if there can be a caſe ſuppoſed, where it might tend to

ſiſting, how are they to be certainly diſtinguiſhed in practice? Few phyſicians would agree with each other, in ſettling preciſe diagnoſtic marks of this indication. How then are untaught owners of cattle, on whom the taſk of judging on this matter muſt depend in the general execution of it, to determine on a point of ſo complex, and nice a nature? On what, according to Doctor Layard's intimation, is to be grounded, *the apprehenſion of the ſymptoms, when prudence will require bleeding to prevent this coming on?* Some anſwer to that difficulty is, indeed, given in another paſſage of his Eſſay below, page 65, where he declares, "If a beaſt be "full-grown, and fleſhy, if a cow big with calf, and "of ſuch colour, as denotes ſtrong fibres, then take "away two quarts of blood from the neck. From a "ſtrong yearling calf, one quart: and ſo on in pro-"portion to age and ſtrength: but neither weakly, nor "poor thin cows, eſpecially white ones, are to be bled "ſo much, if at all." But in the third chapter, where he treats of the prognoſtics, he enumerates theſe circumſtances among the marks, by which it may be diſcerned what beaſts are leaſt in danger of being attacked by the contagion, and ſuffering violently from it; all which marks are, in fact, the appearances of ſtrength, though he has not directly ſaid ſo. Now, if ſtrength be the preſervative from the contagion, and its effects, what is the conſequence of bleeding thoſe which bear ſuch marks, but, in fact, reducing them to the ſame ſtate with the others, which want this ſtrength: or, in other words, rendering them equally unable to reſiſt the effects of the contagion?—Is not this ſetting up of art founded on vague principles, for the ſake of accommodating practice to the notions and hypotheſes of darling writers, in oppoſition to the clear dictates of reaſon, ſuggeſted by obſervation on facts.—In chapter the eighth, ſpeaking of the means to prevent infection, he is led round again to truth, by the force of ſuch obſervation. For there he very juſtly acknowledges the real fact, that

relieve againſt a particular ſymptom, which is only when ſome internal part is inflamed by the depoſit of the matter; yet ſuch caſe would be deſperate, and the evacuation would, in other reſpects, promote the ill effects that lead to fatal conſequences.——Bleeding for prevention of the infection, though not enumerated in the preceding view of the means uſed for that end, has yet been recommended by ſome phyſicians; and frequently practiſed. But, on the ſame principle, of expoſing the beaſts to the force of the diſeaſe by weakening them, it is of the ſame bad tendency, as when uſed for the cure. Indeed it does not in this caſe ſo generally do harm. For when it happens not to be performed nearly at the time of the beaſt's taking the infection, the cattle, except thoſe which are naturally weak, re-

"Bleeding, and purging the cattle, ſo far from being "of uſe, has not prevented the diſeaſe; but rather the "ſymptoms have been more violent in ſome, who were "blooded, and purged." The reaſon is obvious: becauſe, being weakened, the beaſts were leſs able to reſiſt the contagion. But has the bleeding leſs effect in weakening the ſubject, when performed after the infection has taken place than it had before? Surely it has not.—This was delivered candidly, from obſervation on the real phenomena. What we have before quoted was the reſult of theoretic reaſonings, founded on preſumed principles, and the ſuppoſed authority of Sydenham, &c. in points, where in reality no juſt analogy ſubſiſted.

Profeſſor Camper wholly diſapproves of bleeding in this diſeaſe, from an extenſive obſervation of its effects.

cover

cover their ſtrength again: and the evacuation has, therefore, no conſequence with regard to the diſtemper.

Purging has been frequently tried as a remedy againſt the murrain, in all the periods of the diſeaſe. There is evidently the ſame objection to it, as has been made above to bleeding: ſince it undoubtedly conduces to weaken and exhauſt the beaſt: and conſequently to render nature leſs able to reſiſt the force of the contagion.—It is, alſo, from other reaſons, improper in this diſeaſe, by which-ever of the two courſes, a diarrhœa, or eruptions, nature ſeeks to produce a critical diſcharge of the morbid matter. Where there is a tendency to eruptions, as for the moſt part is found in England, this evacuation would neceſſarily make a derivation, and endanger the ſtopping its progreſs: and, indeed, not only with us, but in Italy, according to Lanciſi, "A looſeneſs is an unfa-"vourable ſymptom; and denotes the weak-"neſs of the ſubject." In Holland, it is frequent; and the cattle do recover with it. But where there is a diſpoſition to it, or it is already begun, medicines which promote the ſame evacuation, are certainly not proper: as they either bring it on before the due time; or increaſe it, if already come on, to a degree that is beyond what the ſtrength of the beaſt can bear. This, though not perhaps in every inſtance, muſt

yet be the caſe in the greateſt part.—The moſt judicious obſervers agree, moreover, in condemning the uſe of purges in this diſeaſe, from an actual experience of their bad effects: and the adopting it has been certainly one ſource of the ill ſucceſs which has reſulted in the attempts made to cure the murrain.

Bliſters have been, alſo, tried in this diſeaſe; but not in ſo extenſive a manner as to afford the means of determining, how far they may be of any avail in it.—By the apparent tendency to a paralytic ſtate, which is ſhewn in the firſt period of the murrain, there is room to conclude, that ſuch a *ſtimulus* might come within the intention of cure. But whether it would be adequate to the indication, or trival in its effects, can only be known from a large baſis of obſervation. At all adventures, the difficulty attending the application of bliſters to the diſeaſed cattle, by ſuch perſons as muſt have the treatment of them in general, renders their uſe a very unfit means of relief in the murrain.

Rowels, ſetons, pegging, and cauſtics, have been in their turn vainly employed in the murrain. It muſt be admitted, nevertheleſs, that nature ſometimes throws the morbid matter on a part already diſeaſed by a wound ſo made: and, in that caſe, renders it the means of a critical diſcharge: as we ſee happen in other contagions. But this will rare-

ly be the caſe: and where it may, there is always a ſufficient degree of ſtrength to produce an eruption, which would anſwer the ſame end. In any other circumſtances, the diſcharge from theſe drains can be of no ſervice towards the cure of the murrain. For they muſt know very little of phyſiology, and the hiſtory of diſeaſes, who imagine a purulent diſcharge can be of any conſequence in them, unleſs, at the due period, it be converted into a critical one, by a depoſit of the morbid matter on the part. In all other views, this kind of evacuation rather impedes than promotes the cure of the murrain: as it tends to weaken, and exhauſt the ſubject; and, conſequently, to promote the prevalence of the contagion over nature.

Mundification, performed by extraordinary cleanſings, and rubbing the ſkin of the beaſts, has had great ſtreſs laid upon it by ſome, who have undertaken the cure of the murrain. But it is admitted, by profeſſor Camper, and others, who have ſeen it much practiſed, to be of no avail. Indeed, the effects muſt be too minute, to have any material conſequences in a diſeaſe of ſo violent a nature: and if ſuch laborious, and conſtant cleanſings, rubbings, &c. as are recommended were ſerviceable, the performing them would be impracticable, where there are a great number of cattle infected, without

more trouble or expence, than the chance of benefit from them would countervail.

The inefficacy of the above enumerated various ſuppoſed remedies for the murrain are leſs to be regretted: becauſe a great part of them would be attended with ſuch expence, and trouble, as would render their general uſe inexpedient. And, indeed, the ſame may be ſaid of all of them, according to the manner, they have been preſcribed by thoſe who have recommended them: in which ſeveral always; and, for the moſt part, many of them; have been combined together. —Whatever method of cure is propoſed to be actually ſerviceable in this diſeaſe, it muſt be practicable with a moderate ſhare of expence and trouble; or it will never be put in practice, by the proprietors of the cattle, ſo generally, as to ſave a ſufficient number of them to be of any moment to the public. Very little regard has, nevertheleſs, been had to this conſideration by the phyſicians, who have taken in hand the diſcovering means of relief againſt the murrain. They ſeem only to have ſought after what might be efficacious in nature: and directed the uſe of what they thought ſo, without calculating in the leaſt, whether the conſequence of its uſe could be lucratively of any benefit to the private perſons, who might adopt it; or reflecting, that if it were of no benefit to them, they would not adopt it; nor

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the public, therefore, reap any advantage from it. Even the moſt able of thoſe, who have been engaged in this purſuit, have ſeemed to forget wholly this circumſtance; which is indiſpenſibly requiſite to the forming an effectual plan for the ſaving any material number of the cattle: as it would be more profitable to abandon them to the effects of the diſeaſe, than to incur a greater expence in attempting it, than is ballanced by the value of the chance of ſaving them *.

* In calculating the advantage, that is to be received from any remedy for the murrain, the expence incurred, by the uſe of it, for the number of beaſts actually ſaved, muſt not be conſidered alone; but that of all thoſe, with which it has been uſed, in order to the ſaving ſuch number, muſt be included likewiſe. In order, therefore, to determine the value of the chance of ſaving the cattle by any means of remedy, comparatively with the coſt of ſuch means, it is proper to ſtate the circumſtances in this manner:—It appears that, at preſent in Holland, ſomewhat leſs than half the beaſts, which take the infection recover, without the aid of any medicinal aſſiſtance: and in our country, where, as we have before obſerved, the beaſts are ſtronger, we may, ſafely reckon at leaſt that proportion. But, as it is impracticable, when the ſigns of the diſtemper firſt appear, to diſtinguiſh, with any certainty, thoſe beaſts which would die without aid, it is neceſſary, all thoſe, that are ſeized with the diſeaſe, ſhould be ſubjected to the curative treatment. Let us further, in order to bring the whole matter into this point of view, ſuppoſe a method propoſed, that would, ſave one half of the beaſts, which would die without the aid of it. It will then reſult from theſe premiſes, that, on the whole, to ſave one beaſt, the expence of the medicinal treatment muſt be

The knowledge of thoſe ſymptoms, which are eaſily diſcernible, and beſt diſtinguiſh the murrain from other diſorders incident to cattle; and of the peculiar appearances, that are produced in the inward parts of beaſts which die of it; make, by far, the moſt important object of the communication of what regards this diſeaſe.—It is extremely requiſite, that all owners of cattle ſhould have a moderate acquaintance with theſe matters, in order they may as ſoon, and as certainly as poſſible, be able to inform themſelves, whenever their cattle appear to be

incurred on four: as one half would recover, if they were left to nature; and only one half of the other is to be ſaved by the medicinal aid. For a method which could effect that muſt be juſtly deemed highly efficacious.—In the methods, which have been recommended, and particularly that by the lateſt and beſt writer on this ſubject in our own country, the expence of labour, medicaments, and extraordinary diet, would amount in the treatment of each beaſt, to at leaſt one pound five ſhillings; and, according to ſome preſcriptions, they would riſe to double the ſum: ſo that, in any of theſe methods, according to the manner of computing here laid down, the ſaving each beaſt would coſt at leaſt five pounds; and in ſome of them ten.—This great expence would not only take away all inducements, in the view of gain, from the owners of the beaſts to employ ſuch means for ſaving them; but the greateſt part of ſuch owners would not be able to make the diſburſements neceſſary to it, in proportion to their ſtock of cattle. As the whole muſt be provided, and laid out in a ſhort ſpace of time: and it would, therefore, be more to their intereſt to ſubmit to the preſent loſs, and recruit their ſtock by future reſources.

out.

out of order, or die in a ſuſpicious manner, whether they be infected with this diſeaſe, or not.—Without ſuch means of judging, they may either inadvertently ſuffer the contagion to ſpread in their own herds, or to thoſe of others, if it happen to be introduced to any of their beaſts; or, otherwiſe, be led, from a miſtake of other diſtempers for it, to be at great expence and trouble, in endeavouring to prevent it, when there is no real occaſion.—It is of equal conſequence both with reſpect to the public, and to themſelves, that a certain degree of intelligence of the criterions, by which the murrain may be known from other diſorders, ſhould be poſſeſſed by magiſtrates, conſtables, pariſh-officers, and inſpectors of cattle, particularly thoſe near ſea-ports; that they may, in ſome meaſure, be enabled to put the acts of parliament, and orders of council concerning the diſeaſe, into execution: as thoſe acts lay a taſk upon them, ſhould the occaſion of their being inforced preſent itſelf, of a very nice and complex, as well as momentous nature.—I ſhall, therefore, firſt give an enumeration of thoſe ſymptoms of cattle diſeaſed with the murrain, and a deſcription of thoſe appearances it cauſes in the inward parts of the bodies of beaſts that die of it; which are ſo ſimple and ſtrong, that they may be readily perceived, and diſtinguiſhed by any perſons, however

little

little verſed in the obſervation of diſeaſes, or other ſubjects of medicinal concern.—I ſhall afterwards, for the uſe of others, who may chuſe to cary their ſpeculations further, and attempt the ſtudy or cure of the diſeaſe, point out thoſe more latent, and leſs perceptible ſymptoms and effects of it, which require a previous knowledge of phyſiology to their being properly obſerved: and which are rather uſeful for inveſtigating the nature, and kind of the diſeaſe, and the beſt method of curative treatment of it, than for diſtinguiſhing it, by ſenſible marks, from other diſorders of cattle. I ſhall proceed alſo, to apply the whole to that purpoſe of examination; and to explain whatever can be at preſent collected of the phyſiological principles of the diſeaſe, in order to aſcertain thence the beſt means of prevention of the contagion; and the proper intention of cure to be adopted in the medicinal treatment of ſuch as are already infected.

The firſt apparent ſymptoms of the murrain are,—A dry cough:—a ſhivering, and gnaſhing of the teeth, coming on at conſiderable diſtances of time:—ſhaking the ears; and hanging down of the head, as if from weakneſs:—ſtretching out of the neck, as when there is a difficulty of ſwallowing:—moving often ſlowly from place to place, ſeemingly in a conſtant ſtate of uneaſineſs:—decreaſe of appetite:—diminution,

or, on the fourth day, total loſs of milk, in cows, which are in a milch ſtate; attended with a lankneſs of the belly and udder *: and ſometimes coſtiveneſs. —— During the time theſe ſymtoms *only* appear, the cattle will eat; chew the cud; and, at ſome times, look briſk, and lively: but, after the third or fourth days, the following ſymptoms come on gradually, but quickly; except in thoſe beaſts, which have the diſeaſe in a very mild and gentle manner:

A conſtant heavineſs and ſtupidity: — a general weakneſs: — a great decline of the appetite, and chewing the cud: — a frequent trembling of the whole ſkin; or of particular parts of it, eſpecially about the flank, and

* Doctor de Monchy, city-phyſician to Rotterdam, in his *Remarks on the mortality among the horned cattle*, mentions a decreaſe of milk, and a lankneſs of the belly, in milch-cows; and a drowſineſs and cough, in young beaſts; as ſufficient ſigns, to diſcover this diſeaſe in the cattle. But though they may be good reaſons for ſuſpicion of it, in places where the contagion is already in the neighbourhood: yet they are by no means *alone* juſt grounds to determine, that cattle ſo affected are ſeized with the murrain, when there is no likelihood of the infection's having been conveyed to them. The decreaſe, or even loſs of milk, in cows, and the conſequential lankneſs of the belly, are attendant on any conſiderable feveriſh diſorder: and the drowſineſs, and cough, in young beaſts, may ariſe from colds, or other epidemic diſorders. I have mentioned this, becauſe Doctor de Monchy's diſſertation has been lately tranſlated into Engliſh: and ſuch a paſſage in it may miſlead; and occaſion falſe alarms reſpecting the introduction of the contagion into our country.

buttocks:

buttocks:—a purging in ſome; or a diſcharge from the noſe, and ears:—and a total loſs of the milk in milch-cows, if it has not come on before.

Where the diſeaſe is not ſlight, the above-ſpecified ſymptoms are ſoon ſucceeded by theſe others.—A refuſal of all food, and ceaſing intirely to chew the cud:—an increaſe of purging; the excrement becoming of a very yellow, or of a dark green colour; ſtinking; and, in ſome caſes, coming away of itſelf from the fundament, which ſeems continually open and moving:—a difficulty and ſhortneſs of breathing, accompanied with groaning, and an extraordinary diſtention and widening of the noſtrils:—a ſcabbineſs of the noſe and lips:—a great ſwelling of the belly:—a reſtleſſneſs; uneaſineſs on lying down; and defect of power, through weakneſs, to ſtand, whence the legs are extended outwards, as it were to prop the body:—eruptions on various parts of the body, but particularly about the flank and udder:—miſcarriage in pregnant cows:——and, where the beaſts are ſtrong, hard tumours, like boils, eſpecially along the back on each ſide the bone felt under the *panniculus carnoſus*, or outward ſkin; which frequently break, and diſcharge matter very fetid or ſtinking.

Theſe ſymptoms go on, moſt of them augmenting, till the turn or criſis of the diſeaſe. They then begin to decreaſe, and ſome degree of appetite, and chewing the

the cud to return; if the beaſt recover.—If otherwiſe, the purging becomes greater; or, if there were none before, begins with violence: and the dung paſſes off involuntarily; not only the anus but the tail ſeeming to loſe all power of action. The eruptions, if there be any, flatten; or the tumours, like boils, under the ſkin grow ſoft; and the ſtrength ſeeming to be ſpent, the beaſt dies ſuddenly without any other previous ſigns; or, in ſome caſes is violently convulſed, roars loudly, throws out a large quantity of foam or froth from the mouth, ſtruggles hard, and toſſes about the head with great force.

The ſecond ſtage of the diſeaſe is ſeldom continued longer here than three or four days: reckoning it, as above-mentioned, from the fourth day after the firſt ſigns of the infection. So that the general period of the diſtemper, from the firſt attack which was perceived, to the criſis, or turn, according to the courſe of the diſtemper, as it ſubſiſted here, may be accounted about ſeven or eight days *.

* In Holland the period of the murrain, from the firſt ſenſible marks of it to the criſis or turn, is much longer than it appeared to be with us, and is moſt generally found to be about twelve days. The reaſon of the variation of the diſeaſe in this point, betwixt Holland and here, lies in the ſuperior ſtrength of our cattle; which enables nature in them to bring the diſeaſe to a criſis in ſo much leſs time. This greater degree of ſtrength in our cattle manifeſts itſelf, as we have remarked elſewhere,

The time of appearance of the firſt ſigns after the infection is received, is five or ſix days; rarely more; unleſs where the ſlightneſs of the deceaſe renders the ſymptoms ſo gentle, that they do not become perceptible till in an advanced period of it: but this cannot carry it beyond the ninth or tenth day.

It is not to be underſtood, nevertheleſs, that, in every beaſt, which has the murrain, all the above enumerated appearances will be found. For as different parts are affected in different ſubjects, the ſymptoms vary accordingly; particularly in the laſt ſtage: and the natural, or caſual habit of the beaſt, as to ſtrength, age, and pregnancy, makes likewiſe a conſiderable alteration, both as to the kind, and the degree of the effects of the contagion.—The ſymptoms of the firſt ſtage, except the coſtiveneſs, conſtantly attend, however, in a greater or leſs degree: and the greateſt part of thoſe of the ſecond ſtage follow in a more or leſs violent manner. The diſcharge from the noſe, and eyes is very general; and ſcarcely ever wanting in thoſe beaſts, which recover. The purging, and ſwelling of the belly, are, alſo, very fre-

where, in their more frequently throwing out eruptions in this diſorder here than in Holland; and in their not being ſuſceptible of the infection, except after very bad ſeaſons; though leſs injurious epidemic cauſes render them ſo in that country.

quent;

quent; and almoſt always occur in thoſe beaſts which die. The eruptions, and hard ſwellings like boils, are, likewiſe, very common here *, in thoſe which recover.

On the whole, therefore, by a due obſervation of the manner, in which beaſts ſeem affected, when ſeveral are ſeized with an unknown diſeaſe, at nearly the ſame time, and place, it may be determined, on very good grounds, when the contagion has been introduced.—The hanging down of the head, and ſtretching out of the neck, with other ſigns of weakneſs, coming on in the firſt ſtage; and followed by the inſenſibility, tremblings, eruptions in the flank and udder, or hard ſwellings like boils along the back, and breaking out, or ſcabbineſs about

* Though eruptions were very frequent in the murrain while it prevailed here, yet they are much leſs common, as has been above intimated, in Holland, and other low and damp countries, where the cattle are habitually weaker. When they do appear there, they are, alſo, different for the moſt part from thoſe found in our cattle. For inſtead of being on the back, and large like other boils, they are generally about the flank and udder; and are leſs, flatter, and ſofter. The general criſis of the diſeaſe, in ſuch caſe, is not by eruption, but by a diarrhæa, or looſeneſs, which was found here, on the contrary, to be moſtly a bad ſymptom. This is not, however, conſtant. For there are inſtances of beaſts which do well in Holland without a diarrhæa: and there were ſome here, of thoſe which recovered with it. But the criſis, nevertheleſs, is here, by far the moſt frequently, an eruption, either on the back, or about the noſe and lips; and, in thoſe countries, a diarrhæa.

the noſe and lips, in the ſecond ſtage; may be looked upon as peculiar ſymptoms, which characteriſe the diſeaſe; and leave little room to doubt of its preſence, where they appear.

In order, nevertheleſs, to obtain a more poſitive certainty, in any caſe, where there is reaſon to apprehend from beaſts having died in the manner and with the ſymptoms above deſcribed, that the infection has been brought to any place, it may be further proper, to examine the carcaſes of ſuch beaſts by opening them; and if it be as ſuppoſed, the following appearances, or moſt of them, will preſent themſelves. This examination muſt, however, be confined to ſuch as die from the natural courſe of the diſtemper; and not extended to ſuch as are killed, or have been ſubjected to medicinal treatment: becauſe the diſeaſe has not then had its due and full effect on the parts; and the ſtate, in which they will then be, muſt proportionably fail to anſwer the deſcription above given.

A very ſtinking air, and ſometimes matter, ruſh out on piercing the ſkin, or making an opening into the cavity of the belly; particularly, if there be ſwellings on the back, and the ſkin be prickt or cut in that part. — The mouth, throat, and gullet, are red; and full of ſmall ſpecks, or ulcers, attended with the appearance of what is called

called the thruſh in children.—The lungs are red, ulcerated, ſpeckled with blackiſh ſpots, and ſometimes fraught with ſmall bladders of fluid like water.—The liver is ſwoln: full of dark yellow gall; and rotten, ſo as ſcarcely to bear the touch: and the gall-bladder is ſtretched to a large ſize by greeniſh gall.—The cud-bag, or paunch, is red, and diſcoloured with blackiſh ſpots; puffed up with air to a very great magnitude; and void of any fluid, but containing a hard maſs of cud, which has remained there, and is become dry, inſtead of paſſing to the other inteſtines to be digeſted.—The honey-comb, manifold, and curd-bag are in much the ſame ſtate with the cud-bag, except, as to the various degrees of hardneſs and drineſs of the cud, in the two firſt; and that the curd-bag is empty.—The ſmaller guts are ſpotted with red and black: and the end of the *rectum* or laſt gut, for ſome ſpace above the anus or fundament, is black, rotten, and foul with clotted blood on its ſurface.—The womb is red, and inlarged, in cows that are not pregnant: but, in thoſe with-calf, it is blackiſh.—The fat, where any can be found, is of a high yellow colour, and ſoft conſiſtence.—Collections or gatherings of matter are, frequently, met with in the cavities of the horns, and head.—When the greateſt part of theſe appearances preſent themſelves, in the reſpective parts, on

opening the beaſts, which have died after the principal of the above ſymptoms have been obſerved in them, there can be no room to doubt, but that they have had the murrain.—Even where any accurate information may be wanting of the nature of their illneſs, there is a very ſtrong ground of concluſion, that it was this diſeaſe, if, on the examination of the carcaſſes ſoon after the beaſts are dead, the eruptions, particularly the hard boils along the back; the ſcabbineſs on the noſe, and barbs; the puffing up of the ſkin, or belly with ſtinking air; the gathering of matter in the horns and head; the dry maſs in the cud-bag; the blackneſs of the womb; and the rottenneſs of the gut, next the fundament; or moſt of them; are found.

The ſymptoms and effects of the murrain, which may be deemed, leſs properly than the foregoing, the ſubject of the examination of perſons not converſant in medicinal ſubjects, and leſs apparently the characteriſtic marks of the diſeaſe; but which may yet afford material lights for diſcovering the true nature, and the indications of cure of it; are thoſe which follow.

In the firſt ſtage, heat, but not great, in the head; and particularly at the roots of the horns; attended with a coolneſs of the body, and the extremities:——hot and ſtinking breath:—deafneſs: pulſe quicker than in health; the ſtrokes being from

ſixty to ſeventy, but irregular, though without ſtated remiſſions.

In the ſecond ſtage ſigns of ſickneſs *: —breath more hot and ſtinking: — fetid, ſteams from the ſkin: — reſpiration difficult; particularly expiration laboured, and performed with groaning: — urine high-coloured, and turbid; but generally without any depoſit of ſediment, or any bad ſmell;

* Doctor Layard has mentioned, along with the ſickneſs, the throwing up of bile as one of the ſymptoms of the murrain. He does not intimate, that he had ſeen it himſelf; but refers for it, in a note, to ARETÆUS *De morbis acutis*. The notion of ſuch a fact was a moſt palpable error in the firſt broacher of it, whoever he were; and it is a great inadvertence in the Doctor to adopt it: as he has himſelf, in more than one part of his treatiſe, inſiſted on the impoſſibility of neat cattle's vomiting at all on account of the formation of their inteſtines. Profeſſor Camper has, indeed, ſeemed to contradict this opinion by the relation of a fact. For he declares, that giving a decoction of camomile has made the beaſts vomit. If that did happen, however, it cannot be ſuppoſed to be any other vomiting than the returning the fluid into the mouth from the cud-bag only, by the ſame action, as the cud is brought back thither in order to rumination: which could have no effect towards forcing up bile. Whoever conſiders, that the bile muſt paſs through all the four ſtomachs, in its way from the duodenum to the mouth, muſt be ſatisfied, that it is next to an impoſſibility, any ſuch thing ſhould happen. It is moſt rational to believe, that, if a diſcharge from the mouth, of any thing reſembling bile, on a ſlight inſpection, has been obſerved, it was only of ſome yellow cud mixt with a large proportion of fluid, and miſtaken for bile in default of ſtricter examination.

and retained longer than in health, though not in the whole much different in quantity: — dung acrimonious or ſharp to ſuch a degree as to leave a viſible irritation for ſome time after in the anus: — blood florid: — ſeeming exacerbations of pain in the evening: — a conſtant diſpoſition to lye, but attended with ſuch uneaſineſs in ſome, that they ſtand almoſt continually, though with great difficulty on account of their weakneſs: — an abſence of thirſt throughout the whole diſorder, though with a willingneſs to drink in moderation: — pulſe increaſing in quickneſs, according to the progreſs of the diſeaſe, from ſeventy to ninety; and having periodical diurnal remiſſions, as in the paroxyſms of fevers; but irregular, intermitting, and growing ſmaller as the velocity becomes greater.

On opening the carcaſſes of beaſts dead of the murrain, theſe appearances will occur, together with thoſe before enumerated.

In the brain, the blood-veſſels are found turgid and very red; and clots of grumous blood, as well as a lymphous fluid, ſhew themſelves frequently in the ſubſtance. — On the membrances of the cavities of the noſe, and the whole extent of the frontal ſinus, the large glands, and the medullary ſubſtance of the horns; marks of inflammation and excoriation will be ſeen. — The kidnies, and bladder, are inflamed, and void of urine. — The fleſh, in ſome beaſts is livid; in others of a lively

a lively red, for a ſhort time after the death of the beaſt, but ſoon changing to a green colour.—Appearances are found of *emphyſema*, or veſicles of air, in the lungs, meſentery, and cutaneous membranes in various parts, of the body.

From the whole of the ſymptoms, and appearances, of the murrain, we may draw theſe concluſions, as to the nature and effects of the diſeaſe.

It is communicated from one beaſt to another, by a contagious matter, or *virus*, that, acting as a leven, produces a ferment in the humours of the parts into which it is introduced; and either reduces the nerves of ſuch parts to a paralytic or inactive ſtate; or renders them too irritable and active: at the ſame time counteracting thoſe natural ferments in ſuch humours, which are requiſite for the due ſupport of the animal œconomy. But when, from the ſtrength of the ſolids, giving due motion to the fluids, the natural ferments are duly powerful, it cannot prevail over them; and, therefore, has no morbid effect. As we ſee in thoſe beaſts, which eſcape the infection, though expoſed to the contagion.—In thoſe ſubjects, where, there is a default of ſuch ſtrength, it goes on, by the above ſpecified means, to weaken the force of the circulation; and deprave the ſecretions: whence, alſo, that putreſcence, or putrid ferment, to

which all animal ſubſtances have a natural tendency, when not ſuperſeded by the vital ferments, is at length brought on; and, if no critical expulſion be made, in due time, of the contagious leven by the fever induced by its effects, deſtroys the vital œconomy; and, neceſſarily, cauſes the death of the beaſt. But, if, by the inflammation *produced*, the force of circulation, and conſequently the power of the vital ferment, be ſo increaſed, as to overcome that of the contagious leven, the morbid matter, in which it reſides, is expelled, either in eruptions on the ſurface; or by a diſcharge from the inteſtines.

The progreſs, and the manner of the action of the contagious *virus*, in the murrain, may, from the ſymptoms and the appearances in the dead beaſts, be deduced to be as follows:—The firſt effects of the contagion appear principally in the head, and upper parts. It produces a certain degree of nervous weakneſs or paralytic diſorder in thoſe parts; as is ſhewn by the deafneſs, dulneſs of the eyes, debility of the neck, and ſhaking of the head. This diſorder affects alſo, gradually, the glands, which ſecrete the ſaliva, and lymph of the ſtomach: as there is found, in a more advanced ſtage of this diſeaſe, a total want of thoſe fluids: the cud forming a dry concreted maſs. At the ſame time, nevertheleſs, the glands of

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the noſe, and eyes, are rendered more irritable: and the humours are ſecreted in them much more copiouſly than the natural degree. The paralytic diſorder of the ſalival glands, and the glands of the ſtomachs, extends itſelf frequently, in the firſt ſtage, to thoſe of the ſmall guts: as may be inferred from the coſtiveneſs obſerved at that time. But this often changes afterwards into a great irritability in the ſecond ſtage: as is evinced by the profuſe diarrhæa attending.—On the other hand, the irritability of the glands of the noſe, and eyes, ſeems to be continued to the membranes of the lungs, by the cough, which is almoſt a conſtant ſymptom.—The ſtomachs ſeem, alſo, to partake of the paralyſis of the upper parts: and this appears to be in proportion to their nearer ſituation to thoſe parts: as may be inferred from the retention of the cud in the cud-bag and honey-comb, and the emptineſs of the curd-bag.—There is an early effort of nature, to make an expulſion of the morbid matter by the external parts of the head: as may be collected from the ſigns of topical inflammation, which ſhew themſelves; and particularly about the horns, where abſceſſes are afterwards frequently formed. But this alone rarely proves a critical diſcharge.

After the firſt four days, the contagion diffuſes its effects much more generally; and frequently attacks the liver, and the lower

inteſtines; which then become very irritable: a great diſcharge of bile, and the other humours ſecreted in them, enſuing. But the inactive, or paralytic ſtate of the ſalival glands, and thoſe of the ſtomach, yet goes on increaſing, till all ſecretion by them ceaſe. Hence the appetite, and digeſtion, are entirely loſt: and the inanition, cauſed by the want of a due ſupply of chyle to the blood, conſpires greatly with the nervous debility, above ſpecified, to bring on a great languour of the circulation, and other vital action. This neceſſarily induces a putreſcence of the juices; whence new ſenſible effects are produced; which may be deemed *ſecondary* ſymptoms: being not the immediate conſequences of the action of the contagion; but the effects of the putrid ferment ſuffered to prevail by the ſuppreſſion of the animal ferments, which counteracted it while they ſubſiſted in the due degree. In this difference of the cauſe of the ſymptoms, principally conſiſts the difference of the firſt and ſecond ſtages of the diſeaſe: the firſt exhibiting thoſe alone, which reſult from the action of the contagion on particular parts; and may, therefore, be called *primary:* the ſecond diſplaying not only a further extenſion of ſuch ſymptoms; but thoſe others, alſo, that are cauſed by the general depravity of the fluids, and the conſequential diſorder of the vital œconomy, which ariſe from the putreſcence,

tranſcence, that prevails from the weak action of the ſolids, in giving due motion to the fluids; and from the defect, or perverſion of the glandular ſecretions. In this advanced ſtate of the diſeaſe, a final period is ſoon brought on, either by a ſalutary criſis, or the death of the beaſt. — The morbid matter falling on ſome particular parts, and the general depravity of the humour cauſing obſtructions in others, topical inflammations, and a general irritation follow: whence, neceſſarily, a fever riſes in a greater or leſs degree. By this means, the force of circulation is increaſed, ſo that, where the habit is ſtrong, the natural ferments, being again revived by the accelerated motion of the fluids, prevail over that of the leven of the contagion: and the morbid matter is either thrown on the ſuperficial parts, in caſe of great ſtrength, where it forms eruptions, and tumours; or diſcharged by the glands of the inteſtines, in caſe of a leſs degree of ſtrength. This conſtitutes a ſalutary criſis; in conſequence of which, the beaſts recover from the murrain, at leaſt conſidered as an acute diſeaſe: though they ſometimes die afterwards of the ulcerations or abſceſſes produced then, by it, in the brain, lungs, or other viſcera.—But, if the natural ſtrength be ſo defective, that the irritation, and conſequential fever, cannot produce a ſufficient force of circulation, to give due power to

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the vital ferments, the contagious leven and putreſcence overcome them: and an exceſſive evacuation is made by the liver, and the glands of the ſmall guts, which exhauſts the remains of that power on which animal action depends; while the external and weaker parts ſuffer a gangrene from the depoſit of the morbid matter, and the want of due motion of the vitiated and putrid humours.

This inveſtigation of the progreſs and manner of action of the contagion, according to the ſtate of the ſubject, in the murrain, affords a clear view of the indications of cure.—It is evident, that the ſtruggle here, betwixt health and the diſeaſe, lies in fact, at firſt, betwixt the vital ferments, which ſupport the animal œconomy, and a preternatural ferment, which tends to deſtroy them: and that, conſequently, if the latter prevail, it introduces the putrid ferment to which all animal ſubſtances have a diſpoſition, when it is not controlled by the vital. It is certain, alſo, that the vital ferments depend on the due commixture of the ſeveral humours, and their conſtituent parts, by the circulative motion of the blood, and thoſe other motions of the animal juices, which are performed by nervous action; and that theſe motions are more, or leſs ſtrong, in proportion to the nervous ſtrength of the ſubject: or, in other words, that they are rendered vigorous, or languid, as that ſtrength

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is augmented or diminiſhed. Whatever, therefore, increaſes this nervous ſtrength, or gives tenſion to the fibres, increaſes thoſe motions: and whatever adds to the force of thoſe motions, proportionably increaſes the vital ferments; and conſequently reſiſts the action of the contagion: which cannot take place while they maintain themſelves in their due power.—Hence it follows, that the way to aſſiſt nature againſt the attacks of this diſeaſe, is to keep up the animal ſtrength by ſuch invigorative means as are compatible in other reſpects with the ſalutary œconomy *.

To invigorate, and ſtrengthen, by the adminiſtration of ſuch medicines, as give force to the action of the nerves, and tenſion to the fibres, is the principal abſolute intention of cure: which is dictated by the general nature of the contagion, and its mode of operation.—But there is moreover a palliative or *ſecondary* intention, which ariſes from the conſideration of a peculiar ſymp-

* The ſame intention of cure, as is here propoſed for the murrain, is now perſued, by all able phyſicians, in the contagious, and other diſeaſes of mankind, that induce a putreſcence: experience having ſhewn, that it is the only means which avails in ſuch caſes. It is, therefore, demonſtrated to be the proper method of treatment of cattle in the murrain, not only by reaſons deduced from the ſymptoms of the diſeaſe, and the obſervations of the cauſe, why, amongſt the cattle left to nature, ſome eſcape, and others are carried off; but alſo, from analogy, or compariſon, with the facts reſpecting ſimilar diſeaſes.

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tom.—It appears, from what is above laid down, that the ſtate of the parts ſubſervient to digeſtion denies the performance of that office on ſuch food, as requires the aid of ſaliva, and the lymphous juices ſecreted in the ſtomach: whence the power of the contagion is increaſed by the weakneſs reſulting from the inanition, and the depravity of the humours, in conſequence of the want of a ſupply of freſh chyle to the blood. It is, therefore, a juſt, ſubſervient intention to furniſh a proper quantity of ſuch food, of a fluid conſiſtence, or divided texture, as can be digeſted under theſe circumſtances; and thence to ſupport the ſtrength of the ſubject: which muſt, otherwiſe ſink from the concurrence of this additional cauſe of weakneſs with the effects of the contagion, and putreſcence.

The primary intention of cure in the murrain, according to theſe principles, is to be executed by the adminiſtration of ſuch corroborative, and cordial medicines, as give due tenſion to the fibres, and vigour to the nerves: removing the ſpaſmodic inſenſibility, and impediments to their action; or their too great irritability, whence an irregular mode of action is produced.

There are various kinds of medicaments, which have theſe powers. But experience, in the caſe of ſimilar diſeaſes, and the conſideration of general fitneſs to the peculiar circum-

circumſtances of this, point out two ſpecies, which are more peculiarly proper, as well as efficacious.—Theſe medicaments are the *aſtringent, febrifuge, gummous parts of vegetables*, and *vinous liquors*.

It is found, that various vegetable ſubſtances containing the aſtringent gums, and bitter juices, which poſſeſs the property of tanning leather, have the quality of bracing the fibres in the living animal; aſſiſting to the due tone of the nerves; and thence checking the putreſcence which would, otherwiſe, prevail, in conſequence of a certain degree of weakneſs *.

* It is to the effects of the peculiar kind of aſtringency of the bark, wood, or other parts of vegetables, which poſſeſs the tanning property, in giving due tenſion to the ſolids, and thence producing the due motion of the fluids, as above-mentioned, that their power of reſiſting putreſcence in living bodies muſt be aſcribed; and not, as was before obſerved, to any immediate action on the juices themſelves, by which that diſpoſition is checked: as would happen on the mixture of the ſame fluids, in a proper proportion, out of the body. The proportion of the quantity given medicinally, compared to the whole maſs of fluids on which it is ſuppoſed to act, is far inſufficient to produce ſuch an effect: as may eaſily be aſcertained by experiment of the effect on the commixture of proportionable quantities of the ſame ſubſtances out of the body. The obſervation, that ſuch ſubſtances had the property of checking the putrefaction of animal ſubſtances out of the living body, to which the name of *antiſeptic* has been given, has occaſioned, nevertheleſs, the accounting, by a precipitate judgment, from it, for the effects of thoſe ſubſtances in the living body, without a due regard

The Peruvian bark is the principal ſimple of this kind, which has been hitherto uſed; and experience has not yet evinced any other to be in all reſpects an equal ſubſtitute for it. The efficacy of this drug in intermitting fevers has been long known: and, more lately, its utility in ſome contagious diſorders, and all others where the weakneſs and relaxation of the fibres aggravate the effects, is equally aſcertained. Nor are there wanting ſufficient trials, as was above intimated, to ſhew, that, what might

gard to the proportion of quantity; or attention to the real cauſe of the ſuſpenſion of the putreſcent action in the parts of animals while alive. The miſtake of this principle has not only occaſioned erroneous ſpeculations, but wrong practice in medicine. A very material inſtance of which has been, the adding other ſubſtances, deemed alſo antiſeptic, to aid the aſtringent vegetables: which has been practiſed, as well in the attempts to cure the murrain, as in other caſes. For ſeveral of the ſubſtances ranked in this claſs have a tendency to weaken the ſubject; and conſequently to promote inſtead of counteract putreſcence.

The vitriolic acid, in its ſimple ſtate, or prepared in the form called elixir of vitriol, has been moſt commonly joined to the Peruvian bark, in this view; and rendered it much leſs effectual: as may be well concluded from the injurious effects it has on digeſtion, when weak; and its power of diminiſhing irritability: both which are very oppoſite to the intention, in which the bark is given. — The phyſician, who had, by his writings, moſt propagated this notion, and uſe of antiſeptics, is now convinced, by more mature experience, of the faultineſs of ſuch practice; and candidly acknowledges his diſapprobation of joining the vitriolic acid to the bark in low and weak habits.

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be well preſumed, from analogy, holds good in obſervation on facts, as to its availing, in like manner, in the murrain: though it has never, as far as appears from any reports made to the public, been uſed with thoſe advantages, as to the collateral circumſtances, which would moſt have contributed to render it effectual.

There is, nevertheleſs, a great obſtacle to the giving the Peruvian bark alone to the cattle, in ſuch quantities as might be requiſite in the murrain. This is the high price of it: which would render the adminiſtring it for the time, and in the quantities neceſſary, a conſiderable expence: and it is abſolutely requiſite, to the uſing any remedies in this diſeaſe with benefit to the proprietor of the cattle, that their coſt on the whole ſhould be moderate. It has, therefore, with great reaſon, been thought expedient, to ſpare a part of the bark; and ſubſtitute, for ſuch part, ſome other cheaper ſimple, moſt allied to it in its properties.—The white-willow bark has been ſelected, by ſome, for this purpoſe; and has, indeed, the tanning property in a conſiderable degree: but there are other ſimples, which have that in a ſtill greater; and, alſo, poſſeſs at the ſame time, additional qualities, which materially conduce to the invigorating effects.—The tormentil root is peculiarly adapted to this intention: as it has

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not only the due aſtringency, but the warming and cordial properties of bitters, and aromatics: whence it may check the profuſe diarrhea, which, when it comes in the early period of the diſeaſe, ſo frequently carries off the beaſts, by exhauſting their ſtrength before nature can perfect a mature criſis. This ſimple may, moreover, be eaſily obtained even at the ſlighteſt expence: being one of the moſt common, and general of the herbs, which grow wild in theſe parts of Europe. It may, therefore, be well ſubſtituted for at leaſt one half of the bark, where no early purging comes on; and for three parts in four, where it does: as the quantity of it may then be increaſed with advantage.—It may be proper, likewiſe, to add a proportion of ſome warm aromatic ſimple, of the kind called carminative: and the caroway-ſeed is extremely well ſuited, in all its qualities, to that purpoſe. This will invigorate the action of the ſtomachs; which appears evidently languid: the ſtomachs themſelves, as was above obſerved, participating of the paralyſis of the upper parts.

By vinous liquors, which are the other ſpecies of invigorating medicines proper in the murrain, is meant any kind of fermented liquors, that contain vinous ſpirits.—The late-acquired knowledge of the efficacy of this kind of remedy in contagious, and other

fevers, where putreſcence prevails, has furniſhed the means of aiding nature to reſiſt ſuch diſeaſes, when the natural ſtrength could not otherwiſe ſupport the vital œconomy againſt the effects of them.——The giving wine, in our country, to the beaſts in the murrain, would, however, be impracticable on account of the expence: and, perhaps, good fermented malt liquor is better adapted, on the whole, to the intention than wine. A proper quantity, therefore of ale, that is not too new; or of that kind of malt-liquor, called ſtrong-beer, ſhould be given twice a day: and to render it more cordial, where greater ſymptoms of weakneſs appear, a proportion of ſome *diſtilled* ſpirit ſhould be added to it.—The kind called geneva, is the moſt cheap and eaſily obtained: and the ingredients, beſides the vinous ſpirit, being terebinthinate eſſential oils, are by no means improper in this caſe.

The ſecondary intention of cure, abovementioned, by the ſupply of diet ſuitable to the diſordered ſtate of the digeſtive faculty in the murrain, may be thus provided for.—The beaſts may be fed on hay, ſo long as it appears to agree with them. Though, as there is always a defect of the ſaliva, and the lymphous juices of the ſtomach, as well as a conſequential weakneſs in the digeſtive ferment, it may be proper to mix ſome proportion of

green herbage with the dry fodder. But when the hay, or herbage, cannot any longer be digeſted, as will be indicated by the beaſts refuſal of it, and their ceaſing to chew the cud, it will be requiſite to have recourſe to ſuch other food, as is either fluid, and conſequently does not demand the dilution of the ſaliva and lymph; or ſuch as is of ſo divided a texture, and ſo yielding to maceration, that it may not need the ſtrong action of a digeſtive ferment to its reſolution, or reduction to that ſtate of chyme, which fits it to paſs into the ſmaller inteſtines.—Milk is the moſt nutritive of any fluid, which can be adminiſtered in this caſe: and, if its coaggulation be prevented by the addition of alkalies, to counter-act any accidental acid in the other ſtomachs, that might, otherwiſe, have that effect, it will of courſe paſs forward to the curd-bag: which, from its emptineſs in the dead beaſts, appears not to have loſt its action, as the higher ſtomachs; but to propel duly the chyme, or digeſting matter, into the lower guts.—In order to make a ſaving of the quantity of the milk; which, if uſed alone, would be conſiderable; it may be expedient to add ſome water, and a proportion of ſolid food of the nature above preſcribed.—The moſt fit kind of ſuch ſolid food is corn in a farinous ſtate, that is reduced to meal: which may be of any ſort, that is cheapeſt, and moſt conveniently to be obtained.

obtained. This will be macerated ſo as to mix with the fluid given with it, if the digeſtive ferment be ever ſo weak; and will paſs with it forwards into the ſmall guts, if the action of the ſtomachs be ever ſo ſlight. — By theſe means, proper alimentary matter will be conveyed into the lower inteſtines; and there digeſted: as they and the curd-bag are not, at leaſt in the earlier ſtages of the diſeaſe, ſo diſordered, and rendered incapable of their office, as the three upper ſtomachs: the default of the action of which will, nevertheleſs, in this method, be made of much leſs conſequence.

The nutrition of the beaſts in the latter ſtage of the murrain will be thus provided for; notwithſtanding the impediments, which the effects of that diſeaſe otherwiſe produce to digeſtion: and the inanition thence reſulting, which conſpires powerfully with the other cauſes of weakneſs, and putreſcence, to render the diſeaſe fatal, will be, in a conſiderable degree, prevented.

The alkalies, which may be uſed to hinder the coaggulation of the milk, given as food to beaſts in the murrain, may be a ſmall proportion of ſope, or chalk *. — The

* The uſe of alkalies has been exploded, by ſome eminent writers, in all caſes where a putreſcent diſpoſition prevails, from the notion of their promoting it: and ſome of the moſt ſenſible of thoſe, who have treated of the murrain, have adopted the ſame opinion. But

latter of theſe may be uſed more copiouſly, where a looſneſs comes on too early, or too profuſely: as it will check ſuch an evacuation without the danger of ſtopping it, in caſe it be critical.

By a proper uſe of theſe medicines and regimen, it may be preſumed, on the juſteſt ground of trial and obſervation, as well as of ſpeculative reaſons, that a conſiderable number of the cattle, which would die of the murrain, if left to the natural courſe of the diſeaſe, would be ſaved. It is not to be imagined, nevertheleſs, with the leaſt ſhadow of reaſon, that there is any method of cure, which would avail in every inſtance: the very weak, or diſordered habit of part of the

this objection to alkalies is not juſtly founded: as they have not, when taken in moderate quantities, ſuch an effect in the habit. The proportion of them, given medicinally, is far too ſmall, to have any immediate action of this kind on the whole maſs of fluids: and, in their conſequence, from the operation they may have in the inteſtines, they produce often the contrary effect. For, by deſtroying the aceſcent ferment, which prevails in caſes of weak and diſordered digeſtion, they promote the proper digeſtive ferment; and prevent that increaſe of debility, and general injury to the habit, which the faulty digeſtion would produce.—It may ſeem a paradox, according to the effects of experiments made on the relative ſubſtances out of the body; but it is, nevertheleſs, abſolutely true; that alkalies check, alſo, the putrid ferment of the digeſting matter in the inteſtines: as is plainly evinced by their removing almoſt conſtantly that ſpecies of heart-burn, which ariſes from the putreſcence of animal food, in weak and depraved ſtomachs.

beaſts

beaſts ſubjecting them to the violence of the diſtemper, in a degree beyond the power of thoſe practicable means, that can ſupport their ſtrength. But, if ſuch a number be preſerved from deſtruction, as overballances, on the whole, in any material proportion *, the expence of the treatment of the cattle

* On a moderate computation, the treatment of a beaſt, conformably to the means of cure above-recommended, would not, on an average, coſt the owners of cattle above eight ſhillings in the courſe of the diſeaſe. So that if, according to the principles above-premiſed in the note, page 423, it were neceſſary to practiſe it on four beaſts, in order to ſave one, the actual expence incurred for each beaſt, ſo ſaved, would not amount to above thirty-two ſhillings: which is not more than one third of the price of neat cattle, taken one with another at a time when the diſeaſe prevails. But the advantage to the public would be in much greater proportion than merely this gain, from the effect, the ſaving one half the beaſts, that otherwiſe would die, would have in keeping up the national ſtock; and preventing the ſcarcity from becoming greater: the miſchiefs of which, when it goes beyond a certain degree, augments in much larger than an equal proportion to the ſcarcity itſelf.—To the proprietors of cattle, moreover, the advantage of every beaſt ſo ſaved, would be far beyond the common price of one in other reſpects equal. For, after the diſeaſe has had ſome duration in any place, the value of the cattle, which have had it, riſes very conſiderably, on account of their future ſecurity from the infection.

In the latter part of the time, when it laſt raged here, a cow, which could be well certified to have had it, was deemed to be worth ſixteen pounds, near London; and the ſame holds good now, as to the price of ſuch a cow, in Holland. This circumſtance not only yields an additional motive to the proprietors of cattle, to perſue an efficacious method of cure: but it is pregnant with great advantages to the community. As the recovered

by the method propoſed, the proprietors will find an adequate inducement to put it in practice: and the public will, in ſeveral different manners, reap great advantage from it, if extenſively adopted.

I have for more than one reaſon omitted, at preſent, the giving formal preſcriptions for the medicines, or rules for the regimen. As there will be a more proper ſeaſon for it, if the occaſion for the practice of them ſhould ever again occur in our country.—The knowledge of the ſymptoms and appearances, by which, the diſeaſe may be diſtinguiſhed, are, alone, all that is neceſſary to be generally taught now: but that knowledge, certainly, ought to be diffuſed as univerſally as poſſible.—The explaining, at this time, a method of medicinal treatment, in ſuch a way, as to render it eaſily practicable by the common owners of cattle, would be rather injurious than beneficial, in its effects to the public. What conſtitutes the great object of care, and attention, at preſent, is, the excluding the contagion from our country, by the immediate ſlaughter of the beaſts infected, or expoſed to the hazard of being ſo; and not the attempt of cure *. Reaſon, and

cows muſt here, where a freſh ſupply cannot be had by land, as on the continent, make the principal dependance for breeding, to keep up the ſtock; and for obtaining milk.

* As the means, which ought to be perſued for the national ſecurity, according to the preſent circumſtances,

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the legiſlature both decree that meaſure: and, in order, that what is ordained by au-

in caſe the murrain ſhould break out any-where with us again, are, the killing immediately the cattle infected; and the preventing the removal of thoſe expoſed to be ſo, or of any thing that can convey the contagion; the publiſhing, at preſent, directions for the cure of the cattle, in ſo explicit and familiar a way, as might be eaſily put in practice by the common owners of them, would, probably, have injurious conſequences to the public: as it might produce motives to neglect deſtroying the beaſts, under the hopes of ſaving them by cure.—*It* is, therefore, more proper, while the diſeaſe is confined to one ſpot only, or to a few with narrow limits, to furniſh every aſſiſtance to the quick and certain diſcovery of the diſeaſe, if it ſhould be brought over to us, in order to ſuppreſs it inſtantly, by thoſe means, which are ordained by law, than to encourage any endeavours to ſave ſuch beaſts, as are infected with it.—If, after theſe means of extirpating the contagion have been duly tried, they ſhould be found to have failed of ſucceſs, ſo that the infection has been ſpread over a large extent, or diffuſed into a great number of places, as happened in the former invaſions of our country by it, the caſe would be quite altered: and the ſupplying then, as extenſively as poſſible, the beſt means of ſaving the cattle by medicinal aid, would be a great benefit to the public; becauſe the deſtroying them, under thoſe circumſtances, would be very detrimental, inſtead of advantageous: as it could not poſſibly produce the intended effect; but would cooperate with the diſeaſe itſelf, in cauſing a ſcarcity of cattle.

The continuance of the orders for deſtroying the cattle, after the murrain was extenſively ſpread over the country, had a very apparent bad effect the laſt time it raged here. The viſible conſtant decreaſe of the cattle, as well from the numbers ſlaughtered, as from thoſe which died of the diſtemper; the great room, which it was found the bounty, offered at large, gave for impoſitions, and frauds; and the heavy expence on the pub-

thority, reſpecting this ſlaughter, and the other regulations for the keeping out, and

lic, in providing for the bounty; afforded therefore, the ſtrongeſt reaſons for retracting the orders for killing the cattle.—This inſtance, as well as obvious deductions from the ſubject itſelf, evinces, it is only when the murrain firſt breaks out, and the infection is confined to narrow bounds, that the means and regulations at preſent proviſionally ordained by act of parliament, can poſſibly avail, and be proper. For afterwards, the killing thoſe beaſts, which might otherwiſe recover, would be a palpable loſs, not only of ſo many cattle, but of thoſe that, as we have ſeen before, are, from their future ſecurity againſt the infection, of far greater value than others: and the reſtrictions, with regard to the driving and removing the cattle; the prohibitions of fairs and markets for the ſale of them, &c. would cauſe ſuch a defect in the ſupply of the capital city, as would be attended with very embarraſſing and diſtreſsful circumſtances.

There is another reaſon, why I have deferred giving a formal preſcription for the medicinal treatment of the cattle. It is, that, though I am convinced, from trial and obſervation, the practice recommended is good in a general view; and I could point rules for the conducting the particulars which would be efficacious; yet there are ſeveral circumſtances, with reſpect to which, it is not hitherto aſcertained, by a ſufficient field of experience, what preciſe degree, or mode, would be moſt effectual, and beſt.—Proper meaſures are, therefore, taking, for having ſuch trials made in Holland, where a too fair opportunity is at preſent afforded: and the reſult of them, when they are completed, will afford the means to lay down hereafter, with more certainty, thoſe rules and directions as to each particular, which may be moſt effectual, with regard to the cure, and advantageous with regard to the expence.

In the mean time the generals, here preſented, may enable any perſon, verſed in medicinal ſubjects, to give directions for the putting the cattle under the due regimen, if a juſt occaſion ſhould demand it.

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ſtopping the progreſs of the infection, may be rendered more effectual, I ſhall here ſubjoin a few hints relative to ſome defects, and errors, in the preſent plan of meaſures, which, as they now ſtand, may prevent it's being effectual to the purpoſe.

The firſt, and greateſt defect, attending what is ordained by the government for the ſuppreſſing the contagion of the murrain, in caſe it ſhould be brought hither again, is, the general want of due knowledge for diſcovering the diſeaſe early, on its firſt breaking out; or diſtinguiſhing it, with ſome degree of certainty, in each particular beaſt, from other diſorders incident to cattle.—It is in vain, that private perſons ſhould be injoined by the government to deſtroy their cattle, and magiſtrates to compel them to it, and return them a ſatisfaction, proviſionally the infection be actually in the place, if they be wholly ignorant of any certain ſigns, by which they can diſtinguiſh it. Yet this is almoſt univerſally the caſe at preſent: there being ſcarcely any, but perſons applying to medical ſpeculations; and ſome few others, who may remember what they obſerved during the time of its prevailing here formerly; that are, in the leaſt, acquainted with the nature of the diſeaſe, or its appearances. Moreover, the far greateſt part of thoſe, who may be deſirous of acquiring a due information in this matter,

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are almoſt intirely deſtitute of the means: as there is no method generally known of gaining any ſatisfactory intelligence relating to it: and ſuch lights, as might be obtained, if the means were better known, could not be procured occaſionally, in caſe of an alarm in any particular quarter, before the opportunity of their being ſerviceable was over; and, either the contagion, if it had been really brought, was propagated too widely to admit of a ſuppreſſive remedy; or a needleſs expence incurred, by the neighbourhood, if any other diſorder of the ſuſpected beaſts, had been miſtaken for it.—Many important acts are, by the late ſtatute, required to be done by the magiſtrates, inſpectors, &c. conditionally, that they ſhall *believe* the diſtemper be in any ſuſpected place, or within a certain diſtance of it. But on what, ſhall they ground ſuch a belief on a ſubject, of which they have no means of judging? or who ſhall be qualified to certify ſufficient matter of evidence to them, when every body around them are equally in the dark with themſelves, as to thoſe principles, which furniſh ſuch means?—This ſeems to be a difficulty, in the due execution of the orders of council for deſtroying the ſuſpected cattle, and laying reſtrictions on the removal of thoſe probably expoſed to the contagion, which renders their operation extremely uncertain; and may cauſe great inconveniences

inconveniences from conſciencious and zealous attempts to inforce them, where the facts, on which the right determination of meaſures wholly depends, are ſo eaſily to be miſtaken.——The method to remove this difficulty is ſuggeſted by the very nature of the ſubject itſelf.——It is, obviouſly, the providing the proper means of information of the characteriſtic ſigns of this diſeaſe; and circulating the intelligence of them, as generally as of the orders of council themſelves: in the doing which, the following manner ſeems moſt eaſy and effectual, according to the preſent ſtate of things.

A brief account of the moſt diſcernible and peculiar ſymptoms of the diſeaſe, and of the appearances in the inward parts of the beaſts which die of it, ſhould be procured. This account ſhould be drawn up, in the moſt clear and ſimple manner; and expreſſed in the moſt plain and common language, diveſted of all terms of art, and accommodated to perſons of ordinary capacity. It ſhould then be tranſmitted to every pariſh, and diſpoſed of there, in ſuch manner, that all the inhabitants may be apprized of, and have eaſy means of recourſe to it, whenever they may have occaſion: and more particularly thoſe, who are officially concerned in the execution of the orders of council.—In order to do this moſt conveniently, it may be

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proper to follow, in ſome meaſure, the ſame method, which is taken to promulgate the late act of parliament and the orders of council.—It is ordained by that act, a printed copy of the ſame, together with any orders of council made in purſuance of it, ſhall be provided by the church-wardens, &c. of every pariſh, with intent, that they may be read, by the miniſter, the next Sunday after the receipt of them; and afterwards, on one ſuch Sunday in every calendar month, as he ſhall think proper: and, alſo, that they may be kept by him in order to his permitting every perſon, reſiding in his pariſh, to read the ſame, during the time, the reſpective orders of council may be in force. Now it would be expedient to join a printed copy of the account of the ſigns of the diſeaſe, with thoſe of the act of parliament, and orders of council, that it may be always ready to be conſulted, along with them, or ſeparately, by all perſons, who may have any need of ſuch information.

It would, likewiſe, be very expedient, in order to the rendering more general a due knowledge of this diſeaſe, to have a copy of the account of the ſigns of it, being printed on an open ſheet of paper, hung up in a proper frame in the market-houſe, town-houſe, or any other public building, in each pariſh, where the people may conſtantly have recourſe to it, without troubling the miniſ-

ter;

ter: which would induce them to take more readily the pains to obtain the requiſite information from it. Another copy ſhould be always in the poſſeſſion of every magiſtrate, inſpector, or other perſon, who has any official concern in the execution of the orders of council, that they may have the neceſſary means at hand, of enabling them to judge, how far, in any ſuſpicious caſe, there is juſt ground to conclude the actual preſence of the diſeaſe.

As the greater, or leſs ſucceſs of the injunctions, or regulations ordained by the government for the preventing the bringing into our country the contagion of the murrain, or for ſuppreſſing it, if brought, depends on their being more or leſs generally known, it ſeems, that the preſent means of publication of them are defective: as it is certain, that, by ſuch means, only a ſmall part of thoſe, whoſe conformity to them is requiſite to the end, can be poſſibly thence apprized of them. — A proclamation of all orders of council, reſpecting the diſeaſe, is inſerted in the Gazette; and the laſt act of parliament directs them, as above-mentioned, to be read one Sunday of every month in the pariſh-church, or other place of public devotion.— But few of the common people, and perhaps even the magiſtrates, &c. conſtantly read the Gazette in the country: and there are many pariſhes, into which it never comes at all.—

Numbers

Numbers of perſons, being of other ſects of religion, do not go to the pariſh-church at any time: and others are very liable to be abſent on the particular days when theſe orders are read. The church-wardens, or other officers, moreover, who are to provide the copies of them, not having an opportunity of ſeeing the proclamations in the Gazette, are, ſometimes intirely uninformed of them: and, therefore, do not provide the printed copies of them, as directed.—For theſe, and other reaſons, the reading them duly in the church is often neglected: and, conſequently, the whole, or a great number in every pariſh, are left ignorant of what is ordained. —It is neceſſary hence, that ſome more effectual method of publiſhing the contents of the proclamation ſhould be perſued: and it would be, therefore, right, that the contents of them ſhould be printed in the manner before propoſed for the account of the ſigns of the diſeaſe, and hung up with it, in the moſt public place in every pariſh: which could not fail to make them much more generally and perfectly known than they can be at preſent. This ſhould be, under the circumſtances now ſubſiſting, particularly attended to with regard to the ſea-ports, and pariſhes adjacent to them, of the eaſtern and ſouthern coaſts of the iſland; where the danger is, by far, the greateſt, of the diſtemper's being now conveyed to us from

the ſhores of the oppoſite countries where it rages with great violence.——To obtain the greateſt ſecurity, it would be expedient, that the printed copies of both theſe kinds ſhould be actually ſent to every ſuch pariſh, to be diſpoſed of as above adviſed: and the procurement of them not ſolely intruſted to the church-wardens, by whoſe ignorance of the proclamations, or inadvertence, it will be frequently omitted.—Or, at leaſt, notices of the orders of council, &c. and the injunctions on the church-wardens to procure them, on each occaſion, ſhould be advertiſed in all the principal news-papers, as well in town as country.—In order that the whole of this ſhould be duly executed, it ſeems further requiſite, that ſome proper officer ſhould be appointed, by the crown; to take the charge of doing it on him: and to ſee, that what is ordained may be duly complied with.

Some meaſures of the kind here pointed out are indiſpenſibly neceſſary, to give us any hopes of the good effects of the ordinances of the late acts of parliament, reſpecting the prevention of the murrain: which can yield but little ſafety from it, unleſs generally complied with. For, if from want of due conformity to them, the diſeaſe ſhould find its way into this iſland, in any one place; and ſpread itſelf thence widely to others, as may, in ſuch caſe quickly happen;

happen; it will not be of the leaſt avail, that the ſtricteſt obſervance of them has been practiſed, in a thouſand others: ſince the dreaded miſchief may as well diffuſe itſelf, with all its calamitous conſequences, over the whole of our country, from one ſingle original ſource, as from any multiplicity whatever.

There ſeems to be a very material error in the regulation, ordained in the late acts, reſpecting the prevention of the removal of ſuch cattle, as may poſſibly have been expoſed to be infected by the murrain, or to contract contagious matter on their ſkins, from being near other beaſts ſeized with the diſeaſe: which error may be productive of great inconveniences, if the regulation be duly obſerved; or raiſe motives in thoſe, whom it concerns, for not paying due obedience to the ordinance. This is the too great length of time required, when the infection is ſuppoſed to be in the neighbourhood, for the purchaſers of cattle to keep them before they ſell them again. Forty days is the time preſcribed: and when all the facts, from which, the determination of the proper period muſt be deduced, are duly weighed, it will appear to be at leaſt two thirds longer than is neceſſary.—The only reaſon that can be aſſigned for the expedience of a reſtriction, as to the time of ſelling cattle, in theſe caſes, is, that the ſeller may

may be able to give ſuch a certificate to the buyer, as affords the beſt aſſurance poſſible, that the beaſt has not taken the infection; nor is likely to convey the contagion by any infectious matter, adhering to its ſkin, though not affecting itſelf, from any diſeaſed beaſts it may have approached, to others which may come near it. This period of forty days is allotted: becauſe ſuch a certificate could not be made by the owner, unleſs the beaſt had been long enough in his poſſeſſion, to ſhew it had not been infected before it came into his hands; and to afford time for the infectious matter, if any had been contracted by its ſkin, to have loſt its virtue, or been worn off: and becauſe it was preſumed, a leſs ſpace of time would not have been fully ſufficient for this effect. — As to what reſpects the having actually received infection, forty days poſſeſſion is much longer than is needful to manifeſt, whether, or no, ſuch infection was taken by the beaſt before it came into the ſeller's hands: ſince the ſymptoms would have ſhewn themſelves; and the beaſt would have died of, or recovered from the diſeaſe long before half that time was expired *.—As to what

* It appears, from the experiments made at Utrecht, in 1769, as above-mentioned; and from others, of the inoculation of cattle for the murrain; that the longeſt period, in the caſe of beaſts ſo treated, betwixt their receiving the infection and their death, was not more

reſpects the contagious matter, that may be contracted by the ſkin of the beaſt from others infected, the time, in which ſuch matter may loſe its contagious power, or the ſkin become free from it, cannot poſſibly be aſcertained; and there is reaſon to believe it might go much beyond forty days: but there are eaſy means to be employed of taking away the hazard of conveying the diſeaſe to other beaſts in that way, with far greater certainty than can reſult from the waiting even a much longer ſpace than forty days without the uſe of ſuch means.

The time in which the ſymptoms appear to come on, in the murrain, after the taking the

than fourteen days.—The obſervations on the ſame period, with relation to ſuch beaſts, as have taken the diſeaſe from others, without inoculation, where it could be aſcertained by the known time of their coming within the reach of the infection, ſhew the longeſt extent of it in ſuch caſes, to be about ſeventeen days. But this muſt be underſtood to be according to the courſe of the diſeaſe in Holland. For in our country, the death of the beaſts, taking the diſeaſe naturally, was found to happen almoſt always within twelve or thirteen days after the infection: the criſis or turn of it, as we remarked before, being about four or five days earlier here than in the United Provinces. It muſt be comprehended, alſo, that this period of the death regards beaſts, which are carried off by the murrain, conſidered as an acute diſeaſe: for where they die, after their recovery from the proper ſymptoms of the diſtemper, of ulcers or abſceſſes in the viſcera, produced by it, no regular period can be fixed on: as thoſe accidents, or their conſequences, differ in every ſubject where they happen.

in

infection, is, as we have above obſerved, almoſt generally on or before the fifth day *. But as there may be, though rarely, a variation, that requires ſome latitude, we may rate the longeſt time to be the ſeventh day. In a very few beaſts, however, which have the diſeaſe, in the moſt mild and gentle manner, we may, alſo allow time for the aggravation of the ſymptoms, till they become ſtrong enough to be ſo clearly perceptible, as to leave no

* There is a remarkable uniformity in the operation of the contagion of the murrain, as to the time it produces ſenſible effects, when communicated by exterior infection. — In the above-mentioned experiment, made at Utrecht, twelve cows were put to ſix others, that were inoculated; and kept with them, in a confined place, from the time of inoculation. The twelve were all ſeized with a cough and gnaſhing of their teeth, the ſeventh day after the inoculation of the ſix; and did not exhibit the leaſt difference, in the period of their being affected by the infection; which may be concluded to have been taken five days before: as, at that time, though it was but the ſecond day after the operation, febrile ſymptoms began to appear in ſome of thoſe inoculated: one of which, indeed, was ſo weak on the third day, that ſhe fell down, and had not ſtrength to riſe again. The ſame uniformity is not, in the leaſt, found in the inoculated beaſts: but in moſt of them, the ſymptoms come on with much more celerity, and violence, than in thoſe, which have the diſeaſe by caſual infection.—Many other facts confirm this obſervation of the almoſt conſtant equality of time, in which the viſible effects are produced in the cattle, which have the murrain by natural means; and they leave us no room to ſuſpect, the infection ever lurks after it is taken, without revealing itſelf, more than ſix or ſeven days, even where its action is the weakeſt.

room for doubt; and ſuppoſe, in thoſe inſtances, they may not be very obſervable till the tenth day. But this is the utmoſt conceſſion, as to the extenſion of the time in which the infection can lie concealed without ſenſible effects, that facts will admit us to make: and, if no appearances of the diſeaſe be found at, or before that period, it may be very ſafely concluded, the beaſt had not taken the infection before the commencement of ſuch time.—If nevertheleſs, we ſhould go ſomewhat further, to ſatisfy all ſcruples, as to the inaccuracy of theſe obſervations; and ſtretch our caution to the utmoſt that can be deemed reaſonable, the keeping the beaſts twelve days, after they are purchaſed, is fully ſufficient to determine with the moſt poſitive certainty, that they were not infected before ſuch purchaſe.—There cannot be the leaſt reaſon, therefore, to keep the beaſts longer than twelve days before they are ſold, in order to avoid the hazard of their having received the infection before they came into the hands of the owner.

The other more ſpecious reaſon, for reſtraining the ſale of cattle during ſo long a period, has not, at the bottom, a more ſolid foundation in the reality of facts than the preceding.—No preciſe limits can be aſſigned to the time, that beaſts, having the infectious matter of the murrain lodged on their

their ſkins, in conſequence of having come near beaſts ſeized with diſeaſe, may communicate it, by that means, to others.

The contagious matter will preſerve its infecting quality for a long ſpace of time: as we have reaſon to conclude, as well from facts reſpecting the tranſmiſſion of it into diſtant countries, and ſome experiments regarding inoculation with it, as from its analogy to the variolous matter of the ſmall-pox; which retains its virulent power for many months. There is room to conclude, that the contagion of the murrain has been conveyed by the raw hides of beaſts, in particular, to places, where it has taken effect at a conſiderable ſpace of time after its production: and, if it can be ſo preſerved in the ſkins of dead beaſts, why not in the hair of thoſe, which are living? It muſt be granted, indeed, that in the ſkins of the living, it is more expoſed to be accidently carried off, than in thoſe of the dead: but there is no certainty, nevertheleſs, that it will be intirely cleanſed away thus under a long time. Even forty days, therefore, do not give a ſecurity againſt the danger of a conveyance of the infection that way, where beaſts are removed from the diſeaſed cattle ſo ſhe ſound.—I am aware, it will be advanced, in contradiction to this, that the ſkin of a living beaſt being expoſed to the air, the contagion will be diſſipated in the

forty days; and not preſerved, as in the parts of the hides of dead beaſts, to which the air may not have had a like acceſs. But I deny the truth of the principle, on which this concluſion depends. — It has, I grant, been a prevailing notion, borrowed from antient writers, and delivered down by thoſe of ſucceeding times without any examination of the relative facts, that the contagion of the febrile diſeaſes reſided in volatile effluvia, which exhaled in the air; and flew off in a ſhort time from bodies that had received them. There is not, however, in reality a greater error ſubſiſting than this eſtabliſhed notion. Many experiments on the variolous matter have evinced the contrary, by ſhewing, that it will keep its virtue, and ſerve for the purpoſes of inoculation for a great length of time, though expoſed to the air: provided it be defended from exceſſive cold, and ſuch moiſture as would render it mouldy. A leſs extenſive field of obſervation, but ſufficient to verify the principle, confirms to us, that the analogy holds good, as to this point, on the contagious matter of the murrain; and others of a ſimilar nature.—If, therefore, the virulent matter will not, with certainty, be taken off by accidental means, from the ſkins of beaſts; nor loſe its infecting power, by expoſure to the air, under a long time; the preventing, for forty days, the communications of cattle whoſe

whoſe ſkins may have ſome ſhare of it on them, with any others, is not a full ſecurity againſt their conveying the infection; if, afterwards, they be ſuffered to mix with the ſound.—The eſtabliſhment of this ſpecies of quarentine, or prohibition of removal for forty days, is, conſequently, inſufficient to the end in that view. But, beſide the uncertainty of its effects, and the great inconveniences to particulars it may produce, it is leſs proper, and expedient in this intention; becauſe there is another method, by which the ſame end may be anſwered in a much more eaſy and effectual manner. The method I mean, is, the cleanſing the beaſts by artificial means: which ſhould always be practiſed, where there is the leaſt danger of their tranſmitting the contagion, from thoſe infected to the ſound, without having taken the diſeaſe themſelves. This may be commodiouſly and efficaciouſly performed by ſcouring the ſkins of the ſuſpected beaſts, by a proper bruſh, with fine ſand and water; and afterwards thoroughly waſhing off the remainder of what may adhere, by water and a mop. By theſe means, the ſkin of any beaſt will be more perfectly freed from infectious matter, that was lodged in it, than by the accidental wearing off in a very long ſpace of time: and, if it be duly executed, there can be no reaſon to put the ſale of cattle under any reſtriction on this ſcore.—

The practice of it ſhould, however, be ſtrictly enjoined by authority, if the time of reſtriction of ſale be reduced as propoſed: and the performance of it ſhould be, alſo, made a part of the matter of certification.

As twelve days appear, from the above given reaſons, to be fully ſufficient, to ſhew that beaſts have not received the infection before; and as the keeping them much longer is not ſo effectual a means of taking away the hazard of their tranſmitting the diſeaſe by contagious matter adhering to their ſkin, as artificial cleanſing; the term of forty days reſtriction from ſale ought moſt evidently to be changed to that of twelve days: which ſaves more than two thirds of the time.—This ſhortening the term will be found a matter of very great moment, if ever the occaſion for ſuch a reſtriction ſhall again offer. The great inconveniences, and embarraſſments, that would attend the obligation to keep cattle, however detrimentally to the owner for ſo long a time as forty days would, if it were largely extended, beſides the injuring individuals, conduce, along with the other neceſſary regulations reſpecting the removal of cattle, to the cauſing a ſcarcity of them in the London markets, and others which are ſupplied from diſtant places.—But what is of ſtill greater conſequenc, the loſs and trouble, that would reſult from it to individuals in ſome caſes, would furniſh

ſuch

ſuch motives for a non-compliance with the injunction, as would, in all probability, defeat the intention of it. It, therefore, highly merits the conſideration of thoſe, on whom the direction of this matter depends, to weigh well the premiſes; for a few failures of obedience to the orders of council, reſpecting this reſtriction, may render them wholly ineffectual *. There is no maxim more true, than that a law of this kind

* It may be ſpeciouſly ſaid, that, in a caſe, of ſo much moment, as the prevention of the murrain, the intereſt of particulars muſt give way to the good of the public: that it is beſt to err on the ſafe ſide, by taking a full ſcope of time, which has been deemed forty days, to render the matter intirely clear: and that, if the cleanſing be a further ſecurity, it ſhould be added to the reſtriction of ſale for that term. This way of reaſoning muſt be allowed to be right, as to the general principles; and ought to be adopted, where the facts give juſt occaſion for it: but it fails, in that point, to be applicable to the preſent caſe. The extending the length of time of the reſtriction, ſo much as forty days, does not render the effect of the prohibition more certain, but evidently the contrary.—It is ſhewn above, that if the cleanſing be put in practice along with it, twelve days will be as effectual as forty; and there is a great probability, when the time is not required to be longer, it may be complied with: there being few caſes, where it would then be conſiderably detrimental to the owners of the cattle. Whereas there is the ſtrongeſt reaſon to apprehend, the longer term would not be generally complied with; and, therefore, the ordaining it muſt counteract its own purpoſe; as the ſecurity propoſed from it wholly depends on a general conformity to it.—When obedience to any matter ordained is inforced by a penalty, ſuch penalty will ever fail of its full effect, when the gain accruing

ſhould be void of every thing ſtrongly repugnant to its own operation; or it will prove a dead letter.

To evince more forcibly the extreme great conſequence of guarding againſt the introduction of the murrain into our country, I will here ſubjoin an account of its late effects in the United Provinces; whence the deplorable havock it makes there, will appear in the moſt ſtriking manner.——The ſource of the information reſpecting the

accruing from diſobedience is more than equivalent to the riſk of the forfeiture: as we daily ſee in the great multiplicity of contraband trade. But this principle muſt hold good ſtill more ſtrongly here, where numbers of perſons are unavoidably ſubject to loſs without a diſobedience, than where, as in the caſe of ſmuggling, the occaſion of it ariſes only from a voluntary purſuit of profit. The obliging people to keep their cattle ſo long as forty days, when the injunction ſuddenly and unexpectedly takes place, in caſes when they are not provided with fodder to maintain them, nor poſſibly may be able to procure it without the moſt diſtreſsful difficulties; or where they may lie under a neceſſity of ſelling the beaſts to raiſe money they inſtantly want; will of courſe create temptations to riſk the penalty, that can ſcarcely be withſtood by the weaker part of thoſe, who may be under theſe circumſtances. Whence it is both againſt reaſon, and obſervation, to form expectations of a general conformity to ſuch an injunction. But if the chance of the loſs, and inconvenience, that may caſually attend the keeping the cattle, be almoſt wholly taken away by reducing the forty to only twelve days, the motives will be proportionably removed for running the hazard of incurring the forfeiture, by a non compliance with what is required: and there is juſt ground to hope, that the regulation would be then fully effectual.

facts

facts I ſhall advance, is the regiſtered liſts * of the cattle in the South, and North diviſions of Holland; which I ſhall incorporate: and theſe provinces taken together are nearly equal to one half of the whole United Provinces. — In order to give this account in the moſt clear manner, conſiſtent with brevity, I will enumerate all the particulars of the ſtate of the cattle for the nine months preceding the 1ſt of July laſt: becauſe they are completely exhibited in the regiſters during that term. To this, I will annex the total numbers of thoſe that died, and recovered in one year; commencing the 1ſt of April, 1769; and, alſo, the number which died, and recovered, in each of the three ſucceeding months: as this latter detail leads to ſome as well curious, as uſeful concluſions.

Perſons keeping cattle in South-Holland, and North-Holland, during the term of nine months, commencing the 1ſt of October, 1769, 17379

* The copies of theſe Liſts did not come to my hands till after moſt of the foregoing part of this Diſſertation was printed: otherwiſe, I ſhould have made uſe of the contents of them in ſupport of ſeveral matters, I have advanced there: which, the inferences to be drawn from them greatly tend to confirm.

Cattle

Cattle in the poſſeſſion of thoſe perſons during that term: - - 224999
—— Infected with the murrain, - 141273
—— Died of the murrain: - - 98995
—— Recovered after taking the infection: * - - - 39611
—— Eſcaped the infection: - - 77850
—— Died of other diſeaſes and caſualties: - - - 6488
—— Remained ill of the murrain at the end of the term - 20533

Cattle infected in the term of a year, commencing the 1ſt of April, 1769: - - 210819
—— Died of the diſeaſe during that term: - - - 159128
—— Recovered in that term: - 61691

* It may be inferred from this account, that conſiderably more than half of all the cattle in the United Provinces took the infection of the murrain in nine months: and that almoſt two-thirds of thoſe, which were infected, died.—The number both of thoſe which caught the diſeaſe, and of thoſe which were carried off by it, is proportionably far greater than was found here, while the diſeaſe raged moſt; and even than has been uſually known in Holland: at leaſt one half of the infected having generally recovered. This evinces the preſent exceſs of power in the prediſponent cauſe, or diſpoſition of the cattle to be affected; and verifies by glaring facts, what I ventured to aſſert, relating to it, from theoretic reaſons, in the foregoing part of this Diſſertation, which was printed ſome months ago before I had any particular information reſpecting theſe facts: and, indeed, before the report of them could be made, and regiſtered.

Cattle

Cattle infected in the ſummer ſeaſon of that term; commencing the 1ſt of April, and terminating the 30th of September, 1769: - -	86423
Died in the ſummer ſeaſon: -	63281
Recovered in the ſummer ſeaſon: - - -	32142
Cattle infected in the winter ſeaſon*: commencing the 1ſt of October, 1769; and terminating the 30th of April, 1770. - -	134696

* The number of cattle infected in the winter is, in this account, above two-fifths more than in the ſummer. The reverſe of which appears, with reſpect to the plague, in the Eaſtern-countries: where the contagion of it, for the moſt part, ceaſes, or at leaſt greatly abates in that ſeaſon. But the principle, whence this ſeemingly great variation ariſes, does not, nevertheleſs, lie in the nature of the diſeaſes, nor even in that of the predisponent cauſe of infection in the ſubjects, which is in fact the ſame in both; but in the local difference of circumſtances with reſpect to the production of that cauſe. It is the weakneſs of the ſubject, in both caſes, that conſtitutes the ſuſceptibility of infection; and that weakneſs is induced in different ſeaſons from each other, by a diverſity in the climate, and other circumſtances, attending the places, in which the reſpective diſorders, as here compared, prevail.

In thoſe Eaſtern countries, where the exceſs of temperature lies in the heat of the ſummer, mankind, the ſubject of the plague, are in a too relaxed ſtate, and the juices ſo putreſcent in many individuals, as to render them much weaker than in the winter, which is there mild and ſalutary. In the United Provinces, on the contrary,

—— Died in the winter ſeaſon : -	95947
—— Recovered in the winter ſea-ſon : - - - - -	38749

trary, the exceſs is in the cold of winter: which, being attended with great moiſture in the air, makes the cattle, the ſubject of the murrain, much weaker than in ſummer: to which the houſing them, as is there practiſed from neceſſity during that ſeaſon, much contributes. This increaſed violence of it in winter, and remiſſion in ſummer, did not ſubſiſt here while the diſeaſe prevailed in our country, in any proportion to what it now does in Holland: the leſs damp ſtate of the air, and the keeping the cattle more out in the fields, having prevented them from being weakened, by the inclemency of the winter, as there. On the contrary, this was ſo far from being the caſe, that Dr. Legard ſays, "This diſeaſe being a contagion of the peſtilential "kind, is ſuſceptible at all times and ſeaſons. In au-"tumn and *ſummer* it will rage *moſt*: in ſpring and *win-"ter* leaſt, according to the alterations commonly hap-"pening in thoſe ſeaſons." He carried it much too far, as is evident by the facts here exhibited, in ſaying generally *the diſeaſe will* rage *moſt in ſummer* and leaſt in winter: but he ſpoke from theory only. For ſuppoſing, as he intimates, the murrain to be analogous to the plague, he concludes the ſame effects would always attend the contagion of both, without conſidering the prediſponent cauſe, on which the operation of it depends, may vary in different places.

A more cloſe inquiry, perhaps, into the courſe of the diſtemper here, would have prevented this error.—The whole, however, concurs to demonſtrate, there is no intrinſic difference, in this point, betwixt the contagion of the plague, and that of the murrain; but that the variation of the effect of them depends on the variation of circumſtances reſpecting the prediſponent cauſe in different places.

Cattle infected in the term of three months, preceding July 1770 *: - - -	3912
Died in that term: - -	3048
Recovered in that term: -	864
Died in April of that term: - -	1254

* The number of cattle infected in theſe three months is only in the proportion of about an eighteenth part of thoſe in the winter ſeaſon: and yet of them near four-fifths died. Theſe beaſts may, therefore, be preſumed to be ſuch as laboured under ſome conſtitutional, or other peculiar cauſe of weakneſs, from which the favourable temperature of the weather could not free them.—In June, the number infected was not one ſixth part of that of either of the two preceding months; nor, conſequently in the proportion of ſo much, as one hundredth part of thoſe of the winter ſeaſon: the number which died were, nevertheleſs, ſtill more, in proportion, than in the two preceding months.—This evinces that the heat of the weather, though favourable to the beaſts in health, as to the preſerving them from infection, was injurious to thoſe whoſe weakneſs made them take it: which may be eaſily accounted for, from the greater tendency, that the animal fluids have to putrify in hot ſeaſons. Whence it may be inferred, that it is not a greater diſpoſition in the humours to putrify, independant of weakneſs, which cauſes the ſuſceptibility of infection, but weakneſs only: and that, therefore, unleſs the degree of this diſpoſition be ſuch as induces weakneſs, it does not contribute to the reception of the contagion though to its ſtronger operation when received. This confirms what I have above advanced, that putreſcence has not primarily any concern in the cauſe of the murrain, but in the conſequences of it: as, being either before ſubſiſting or produced by the operation of the infection, it aggravates the fatal effects as a ſecondary cauſe.

Cattle

——— in May: - - - 1325
——— in June: - - - 469
—— Recovered in April of that term: - - - 452
——— in May: - - - 39
——— in June: - - - 100

It apppears, from the finance accounts, that the province of Holland, if the two diviſions of North and South, from the ſeparate liſts of which, this account is formed, be taken together, may, as was before intimated, be conſidered as one half of the Seven United Provinces, at leaſt with reſpect to the cattle. So that, if we admit the ſuppoſition, for which there is good ground, that the ravage made by the murrain, was nearly the ſame in the other Six Provinces, as in that, we may conclude, that the loſs of cattle deſtroyed by it, in the whole, was not leſs, in one year, commencing April 1ſt, 1769, and ending March 31ſt, 1770, than three hundred, and eighteen thouſand beaſts. And there is little room to hope from appearances, that the diſeaſe will be leſs violent this year than it was the laſt.

If we reflect, that this immenſe loſs is, in ſome degree, annual at preſent in the United Provinces, we cannot but deem the being afflicted with the murrain, a moſt

deplorable calamity: and this uncommonly ſtrong prevalence of the contagion there, ought to be equally an object of our dread, as of our compaſſion. It ſhews a very great prediſpoſition in the cattle to be affected by this diſeaſe; and that prediſpoſition is owing to cauſes, which, from their very nature, are extended over all the neighbouring countries, in ſome proportion: as is further manifeſted, by the actual progreſs, the contagion is now making in parts, where there is no endemic or local cauſe, in the cattle, of the ſuſceptibility of the infection. We ſee, by his Majeſty's late proclamations, that it has paſſed into Flanders; and is now ſpreading thence to the adjacent countries of France *,

* This rapid progreſs of the contagion, and extending of its effects into places, where it ſpontaneouſly extinguiſhed a conſiderable number of years ago, and has never, before revived, ſince, is, together with the great epidemic prevalence of the diſeaſe in Holland, diſplayed in the above-given account, a ſtrong confirmation of the truth of the principles, whence I formed a judgment *à priori* of the preſent ſuſceptibility of the infection in the cattle throughout all theſe parts of Europe. As my prediction, relating to the conſequences of it, given in the foregoing part of this Diſſertation, is verified by theſe facts, which have happened ſince the printing it, the certainty of thoſe principles ought to excite the greateſt apprehenſion of our danger from them; and the moſt powerful motives for our very earneſt attention and care to guard againſt this menacing evil.

where there are no unfavourable circumſtances, as in the United Provinces, for the beaſts to be more particularly ſubject to the diſeaſe; unleſs, in common with thoſe of the neighbouring countries, from the accidental influence of bad ſeaſons. This cauſe ſubſiſts alike with us: and we are equally expoſed to all the miſchievous conſequences of the contagion, if it be introduced into our iſland: which, without the greateſt care in the exerciſe of due preventive means, is extremely liable to happen from the proximity of the places where the infection now prevails, conſpiring with the ſuſceptibility of it, that attends the cattle at this period. — It, therefore, highly behoves every individual to exert his utmoſt endeavours, according to his ſituation, to avert this impending danger of one of the moſt heavy calamities that can befall any European country: and more eſpecially our own; where the luxurious habits of the common people, the difficulty of obtaining a ſupply of cattle from other places, and the high prices of the neceſſaries of life, would render the effects of a ſcarcity of horned beaſts, and conſequently all other proviſions, peculiarly grievous and intolerable. R. D.

END OF VOLUME THE SECOND.

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